1985
ANNUAL
REPORT

ALBERTA HORTICULTURAL RESEARCH CENTER

Alberta
AGRICULTURE

86-05228/

ALBERTA HORTICULTURAL RESEARCH CENTER STAFF

1985

ADMINISTRATION

Priscilla Peterson
Secretary Personnel

Tom Krahn
Director

Huber Ellis
Administrative Officer

ENVIRONMENTAL HORTICULTURAL SECTION

Brendan Casement
Ornamentals

Gordon Grant
Greenhouse Crops

VEGETABLE AND SPECIAL CROPS UNIT

Clive Schaupmeyer
Potatoes

Paul Ragan
Vegetable Crops

James Letal
Seed Potatoes

Lloyd Hausher
Market Garden Crops

Refe Gaudiel
Special Crops

Greg Reimer
Annual Forages (FFF)

LABORATORY SERVICES SECTION

Ron Howard
Section Head — Pathology

Ken Mallett
Post-Harvest Storage

Terry Smyrl
Food Processing & Quality

Rudy Esau
Weed Control

Marilyn Dykstra
Diagnostician

Ulf Soehngen
Entomology

FARM OPERATIONS

Evert Borkent
Manager

1985 ANNUAL REPORT

ALBERTA HORTICULTURAL RESEARCH CENTER

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DIGNITARIES ON FIELD DAY
(Carroll Photo-Graphics)

TABLE OF CONTENTS

PAGE

INTRODUCTION 1

Alberta Horticultural Research Staff 2
Staff and Program Changes in 1985 5
AHRC Advisory Committee 6
Field Day 7
Meteorological Report 7

PROGRAM REPORTS

Greenhouse Program 9
Ornamentals Program 13
Native and Bush Fruit Program 19
Market Garden Program 22
Vegetable Program 28
Potato Program 31
Seed Potato Program 37
Special Crops Program 40
Plant Pathology Program - Brooks 54
Plant Pathology Program - Olds 60
Post-Harvest Program 63
Weed Control Program 68
Food Processing and Quality Evaluation Program 73
Entomology Program 79
Regional Crops Laboratory Program 85

PUBLICATIONS AND PRESENTATIONS 89

APPENDICES

Appendix I. Conversion Table 98
Appendix II. Common and trade names of fungicides referred to in this report 99
Appendix III. Common and trade names of herbicides referred to in this report 99

LIST OF TABLES

TABLE		PAGE
1	Maximum, minimum, and mean temperatures (°C) at the Alberta Horticultural Research Center, Brooks, 1985	8
2	Temperature, precipitation, and sunshine data for the growing period, May 17 to September 19, 1985	8
3	Ranked means of average mass per fruit for six cultivars of Cucumis sativus	10
4	Ranked means of number of fruit for six cultivars of Cucumis sativus	10
5	Means of average individual fruit weight, total number of marketable fruit, and total production of four cultivars of Cucumis sativus grown under NFT culture	11
6	Growth characteristics of 'Annette Hegg Red' poinsettia grown in two artificial mixes	12
7	Woody ornamental plants introductions, 1980	15
8	Commercial vegetable crop production figures for Alberta, 1985 vs. 1984	28
9	Percent by number and average weight of seed piece types for Russet Burbank and Norchip potatoes sampled from ten grower cut-seed lots	36
10	Summary of aphid sampling, 1985	39
11	Approximate acreages and yields of some special crops in Alberta, 1985	40
12	Survival of Verticillium albo-atrum in infected alfalfa hay exposed to eight temperature regimes for varying time periods	58
13	Percentage of sucrose, glucose and fructose in fresh and stored beets loaded into standard and cushioned trucks	74
14	Influence of beet moisture content and storage on moisture, sucrose, glucose, and fructose contents of beets	75
15	Seed characteristics of six saskatoon cultivars	76
16	Absorbance of freeze-dried sugar solutions at 280 and 420 nm as a function of pH, temperature and reaction time	77

Table		Page
17	Results obtained at the Canadian Leafcutter Bee Cocoon Testing Center in 1984/85	84
18	Summary of plant specimen receipts at the Southern Alberta Regional Crops Laboratory in 1985	85
19	Summary of specimens received at the Regional Crops Laboratory, Olds, during the period May 1 - December 19, 1985	88

Dr. G. Collin, Mr. P. D. McCalla, Mr. P. D. Hargrave, Mr. T. R. Krahn, and Dr. J. Wiebe

Planting commemorative Red Oak in Golden Prairie Arboretum on Field Day

(Carroll Photo-Graphics)

INTRODUCTION

The Alberta Horticultural Research Center (AHRC) is a branch of the Plant Industry Division, Alberta Agriculture. The Center is located at Brooks, with additional facilities at Olds, but has province-wide responsibility for research and extension in horticultural crops, which it shares with its sister institution, the Alberta Tree Nursery and Horticultural Centre (ATN & HC) at Edmonton.

The Center works closely with other segments of Alberta Agriculture as well as with the University of Alberta, Agriculture Canada, Alberta colleges with horticultural programs, other Alberta Government departments, many grower associations, and individual farmers.

Staff at the Center provide highly specialized service and information on the traditional horticultural crops including potatoes, seed potatoes, vegetables, fruit, annual and woody ornamentals, greenhouse crops, and herbs and spices. There are also scientists working with grains, legumes, annual forages, and leafcutter bees. A Regional Crops Laboratory provides a diagnostic service for all forms of pests and diseases. Support for the crop research and advisory service is provided by the plant pathology, entomology, post-harvest physiology, weed control, and food science programs.

Most of the commercial horticultural and special crop production of Alberta occurs in the warmer, irrigated, southern region of the province and much of the effort at AHRC is concentrated in this area. However, this is partly balanced by research demonstration plots and co-operative trials in the Peace River, Edmonton, and Bow Island areas as well as in other locations in the province. At Brooks, research is conducted on the Center's three farms, whereas, most research trials at off-Center locations are conducted on plots leased from individual growers.

ALBERTA HORTICULTURAL RESEARCH CENTER STAFF

December 31, 1985

Thomas R. Krahn, B.Sc. (Ag), M.Sc., P.Ag. ..... Director
Priscilla Petersen ..... Secretary & Personnel

ENVIRONMENTAL HORTICULTURE SECTION

This section is involved in research and production of fruit, ornamental, and greenhouse vegetable and flower crops. Extension services covering these commodities are also offered.

Section Administration and Fruit Crops

Vacant ..... Fruit Crops Specialist
Pat Moskaluk ..... Section Secretary
Te-Sen Pih, B.Sc., M.Sc. ..... Technologist

Ornamentals, Nursery Crops & Grounds

E. Brendan Casement, B.Sc.(Ag), M.Sc., P.Ag. ..... Research Horticulturist
Nigel Seymour, Dipl. Hort. ..... Technologist
Rick Rumney, Dipl. Hort. ..... Technologist

Greenhouse Crops

Gordon Grant, B.S.A., M.Sc. ..... Research Horticulturist
Vacant ..... Technologist

VEGETABLE & SPECIAL CROPS UNITS

These Units provide developmental facilities and extension services for vegetable, potato, seed potato, corn, pulse and other special crops. The applied research conducted includes cultivar and cultural trials.

Potato

Clive A. Schaupmeyer, B.Sc. (Ag), M.Sc., P.Ag. ..... Research Horticulturist
Greg Feth, Dipl. Hort. ..... Technologist
Devon Curry, B.Sc.(Ag) ..... Technologist

Vegetable Crops

Paul Ragan, B.Sc.(Ag), M.Sc., Ph.D..... Research Horticulturist
Toru Maruno, Dipl. Eng. ..... Technologist

Seed Potato Improvement and Regional Crops Laboratory

James Letal, B.Sc., M.Sc. (Ag) ..... Plant Pathologist
Will Davies, Dipl. Pl. Sc. ..... Technologist
Steven Slopek, M.Sc. M.P.M. ..... Diagnostician
(Contract employee through Olds College)

Market Garden Crops

Lloyd Hausher, B.Sc.(Ag) ..... Research Horticulturist
Murray A. Briant, Dipl. Hort. ..... Technologist

Special Crops

Refe Gaudiel, B.S.A., M.Sc., Ph.D. ..... Research Agronomist
Collin Wildschut, Dipl. Hort. ..... Technologist
Greg Riemer, B.Sc., M.Sc., P.Ag. ..... Research Associate (FFF)

Mayumi Tanigami-Bunney ..... Secretary

LABORATORY SERVICES SECTION

This section provides technical resources for the commodity-oriented programs at the Research Center. Services provided include diagnosis and control of plant diseases, insect pests and weed problems, food processing and product development, crop storage research, and work with leafcutter bees.

Section Administration and Plant Pathology

Ronald J. Howard, B.S.A., M.Sc., Ph.D., P.Ag. .. Section Head and Plant Pathologist
Karen Chapman ..... Section Secretary
Edward Moskaluk ..... Laboratory Technician

Post-Harvest Physiology & Storage

Ken Mallett, B.Sc., M.Sc., Ph.D. ..... Post-Harvest Specialist/ Plant Pathologist
George A. Smith, Dipl. Hort. ..... Technologist

Food Processing & Quality Evaluation

Terrance Smyrl, B.Sc. (Hons.), M.Sc., Ph.D. ..... Food Scientist
Margaret Dench ..... Laboratory Technician
Joseph Hung, B.Sc., ... Laboratory Technician

Weed Control

Rudolph Esau, B.S.A., M.Sc., P.Ag. ..... Weed Control Specialist
Vicky Rumney, Dipl. Agr. ..... Technologist

Regional Crops Laboratory

Marilyn Dykstra, B.Sc. (Ag), M.Sc..... Diagnostician

Entomology

Ulf Soehngen, B.Sc., M.Sc., Ph.D. ..... Entomologist
Arthur Tellier, Dipl. Hort. ..... Technologist

ADMINISTRATIVE SERVICES

This section provides office management, purchasing, accounting services, budget control and contact with Alberta Public Works Supply and Services.

Huber Ellis ..... Administrative Officer
Anna Moeller ..... Accountant
Betty Ann Humphreys..... Receptionist & Timekeeper
Joyce Clark ..... Librarian & Hostess

FARM OPERATIONS

This section provides general farm support operations for the Center. This includes the repair and maintenance of equipment used in all farming operations.

Evert Borkent, Dipl. Hort..... Farm Manager
Henry Christesen ..... Assistant Farm Manager
William Coffey ..... Stockkeeper
Berend Witteveen ..... Mechanic
Barry Merkl..... Maintenance Worker
David Houseman..... Farm Worker
Ludolf Velting ..... Farm Worker
William Wise ..... Farm Worker

STAFF AND PROGRAM CHANGES IN 1985

The preceding list shows staff on December 31, 1985. The following changes were made during the calendar year.

Those who were appointed:

Marilyn Dykstra	Diagnostician	January 14
Ken Mallett	Post Harvest Physiologist	May 1
Gordon Grant	Greenhouse Crops Specialist	May 6
Toru Maruno	Vegetable Technologist	July 1
Pat Moskaluk	Environmental Horticulture Section Secretary,	July 15

Those who left AHRC staff:

Mirza Mohyuddin	Greenhouse Crops Specialist	February 1
Michael Haws	Vegetable Technologist	May 2
Cynthia Hill	Greenhouse Technologist	November 30
Kathy Irwin	Secretary	April 12
Sithamparapillai Mahadeva	Section Head, Environmental Horticulture Section	August 31

Staff Deletions

Two permanent positions were abolished on March 31, as part of the government's overall size reduction of the public service.

Staff Additions

Effective April 1, 1985 administrative responsibility for the Alberta Seed Potato Improvement Program and the Regional Crops Laboratory, both located at Olds were transferred from the Crop Protection Branch of Alberta Agriculture to the Alberta Horticultural Research Center.

The Vegetable and Special Crops Section, as identified in the 1984 Annual Report, was reorganized into a unit structure with each program leader reporting to the Director.

AHRC ADVISORY COMMITTEE

The Advisory Committee consists of representatives of industry, senior government, and university. The Committee is charged with evaluating Center programs and advising the administration and/or the government on programs and future direction of the Center.

The summer meeting of the Advisory Committee was held on June 27 at AHRC. Emphasis was placed on the Vegetable and Market Garden programs. Program summaries were provided and a tour of research plots was conducted.

The Committee's fall meeting was held on December 3 at which time all programs were reviewed. Time was spent developing comprehensive terms of reference for the committee.

The membership of the AHRC Advisory Committee at the end of 1985 was as follows:

Member	Representing
Edward Good - Red Deer (Chairman)	Flowers Canada
Bernie Butterwick - Calgary	Alberta Potato Commission
Tiosh Hironaka - Rosemary	Alberta Potato Growers Assoc.
Tony Heuver - Strathmore	Landscape Alberta
Dennis Fauth - Taber	Food Processors
Henry Dueck - Taber	Alta. Vegetable Mrktg. Board
Wm. T. Andrew - Edmonton	University of Alberta
Gordon Dorrell - Lethbridge	Agriculture Canada
Bob Ermter - Calgary	Hort. Seed & Supply Trade
Tom Krahn - Brooks	Director - AHRC
John Wiebe - Edmonton	Director - Plant Industry Div.
Reuben Huber - Rosemary	Alta. Fresh Veg. Mrktg. Brd.
Douglas Cooper - Lacombe	Field Crops Branch - Alta. Ag.
C. Sherry Clark* - Airdrie	Director Region II - Alta. Ag.
Eric Horton* - Lethbridge	Director Region I - Alta. Ag.
George Grainger - Edmonton	Director - ATNHC
Jack Bastiaasen - Bow Island	Pulse Growers Association
Jim MacIntyre - Rosedale	Alta. Market Gardeners Assoc.
D. Gourlay - Millet	Alta. Gr.House. Growers Assoc.
Vacant	Fruit Growers Society of Alta.

* Regional Directors for Region I and II alternate as voting members.

FIELD DAY

The 1985 Field Day marked the Research Center's Fiftieth Anniversary. This twenty-third annual field day was attended by approximately 2400 people, who came to participate in special golden anniversary activities. The theme '50 Years of Progress' was supported by tours, special displays, and demonstrations.

A number of commemorative activities were also conducted. All former directors were invited to participate in the official ceremony. The Center's arboretum was officially dedicated as the 'Golden Prairie Arboretum,' and building 3 was officially named the 'Jan Van Otterloo Building' to recognize the many years of service Mr. Van Otterloo gave to the Center.

Special recognition was received from the Department of Agriculture, the Town of Brooks, the County of Newell, and the Eastern Irrigation District. A reception for all former staff was also held.

The Center looks to the future with the same dedication as its staff has demonstrated in its first fifty years.

METEOROLOGICAL REPORT

Summary of 1985 Weather and Growing Season - G. Smith

April, May, and June were dry, while May was also hot; the highest temperature in Canada was recorded at AHRC on May 21 at 28°C.

Early July was also hot and dry. The remainder of the growing season was cool, but average readings for precipitation were recorded. Cool and wet conditions prevailed during September and October.

Table 1. Maximum, minimum, and mean temperatures (°C) at the Alberta Horticultural Research Center, Brooks, 1985

Month	Extremes for month		Means for month			31 year[z] average (mean temp)
	Max.	Min.	Max.	Min.	Mean	
January	6.0	-38.0	- 5.9	-19.3	-12.6	-13.9
February	6.5	-37.5	- 6.2	-19.0	-12.1	- 8.8
March	15.5	-13.5	4.5	- 6.0	- 0.7	- 3.4
April	25.0	- 4.0	13.3	- 0.2	6.5	5.1
May	29.0	- 2.5	20.9	4.5	12.7	11.8
June	32.0	- 1.0	22.8	6.2	14.5	16.0
July	35.5	6.0	27.6	11.6	19.6	19.8
August	30.5	2.5	22.9	9.0	16.0	18.1
September	22.0	- 7.5	13.4	3.0	8.2	12.1
October	20.5	- 9.0	12.1	- 0.6	5.7	6.1
November	9.5	-35.0	- 8.9	-18.4	-13.6	- 3.3
December	9.0	-34.0	- 1.0	-12.7	- 6.8	- 9.5

[z]From AHRC records.

Table 2. Temperature, precipitation, and sunshine data for the growing period, May 17 to September 19, 1985

Month	Growing period above -1.6°C (days)	Frost-free period above 0°C (days)	Precipitation (mm)	Sunshine (h)	Corn heat units (CHU)
May 17-31	15	Nil	5.3	294.2	257.00
June	30	27	22.0	354.5	490.85
July	31	31	38.8	348.5	687.39
August	31	31	53.4	251.7	561.91
September	19	5	57.2	129.3	165.68
TOTALS	126	94	176.7	1378.2	2162.83
30-year average[y]	135.2	114.6	197.8	1280.1	

[y]Environment Canada average (1951-1980)

GREENHOUSE PROGRAM

COMMODITY REVIEW - G. Grant

The Alberta Greenhouse Industry had a good year in terms of yields. The total area in production as established by the Alberta Greenhouse Growers' Association (1984) was 129.0 ac (52.2 ha).

There are now 37 growers with 23.7 ac (9.6 ha) in greenhouse cucumber production in the Redcliff/Medicine Hat area. Approximately 2.0 ac (0.8 ha) of new greenhouse area was added in 1985. Total cucumber production was 2 820 000 kg at an average price of $7.33 per kg. Increased pesticide costs for thrips control had a negative impact on cucumber growers.

Hydroponic tomato production in southern Alberta was reduced by 2.5 ac (1 ha). There are currently seven hydroponic tomato greenhouses in southern Alberta. Approximately 188,000 kg of hydroponic tomatoes were produced in the Welling/Raymond area with an average production of 20.1 kg/m^2. Low wholesale tomato prices had a serious negative impact on tomato growers.

The Alberta Greenhouse Growers' Association held its 3rd Annual Convention on October 21, 22, and 23 in Calgary. Approximately 230 people were in attendance. AGGA workshops were held in Calgary and Redcliff.

GREENHOUSE VEGETABLE CROPS - G. Grant, C. Hill, and M. Mohyuddin

Rockwool Production of English Cucumbers

Long English cucumber cultivars Corona, Maja, Marum, Sandra, Toska, and 5004 were seeded on January 4. Seedlings were transplanted to rockwool beds on February 11, day and night temperatures were set at 21°C, and plant density was 2.5 plants/m^2. Plants received a constant feed using an Anderson injector. Fertilizer program can be found in 'Guide to Cucumber Production in Alberta.' Harvesting began on March 8 and was terminated on July 2. The average weight of the fruit of the six cultivars and the mean (average) number of fruit per plant are presented in Tables 3 and 4.

There was no significant difference in total production of the six cultivars on rockwool. There is a relationship between number of fruit and size of fruit (average mass per fruit) with the cultivar (Maram) producing the most fruit also producing the smallest fruit. The cultivar 'Sandra' produced the largest fruit and scored high in the total number of fruit. Hence, 'Sandra' may be better suited to rockwool culture over more the commonly grown cultivars such as 'Corona.'

Table 3. Ranked means of average mass per fruit for six cultivars of Cucumis sativus

Cultivar	Mean average mass/fruit (kg)
Sandra	0.369
Toska	0.359
Maja	0.353
Corona	0.346
5004	0.337
Maram	0.253

Table 4. Ranked means of number of fruit for six cultivars of Cucumis sativus

Cultivar	Mean number of fruit
Maram	6.632
Sandra	4.221
Maja	3.949
Corona	3.919
5004	3.737
Toska	3.449

Nutrient Film Technique Production of English Cucumbers

Four cultivars of long English cucumbers were seeded on May 20. Shortly after germinating, the seedlings were planted into rockwool cubes. Cultivars, 'Brucona,' 'Brudania,' 'Corona,' and 'Vitalis' were placed in NFT channels on July 29. Harvesting began on September 23 and was terminated on November 8 due to an outbreak of powdery mildew. Minimum day and night temperatures were maintained at 21°C. Fertilizer regime was set at a 2:3 N:K ratio (200 ppm NO_3:300 ppm K) with electrical conductivities set at 2.25-3.00 with pH ranges of 6.0-6.5. The average weight of fruit and the total yield per plant are presented in Table 5.

Two cultivars consistently performed better in NFT culture than the others. Brudania was ranked highest for all three factors followed by Vitalis. These two cultivars produced heavier fruit in larger numbers and as a result are more suitable for NFT culture than Corona or Brucona. It is interesting to note that older cultivars such as Corona are not well suited to modern technologies in cucumber production.

Table 5. Means of average individual fruit weight, total number of marketable fruit, and total production of four cultivars of Cucumis sativus grown under NFT culture

Cultivar	Average fruit weight (kg)	Total number of marketable fruit	Total fruit production
Brudania	0.397	2.806	1.106
Vitalis	0.255	2.111	0.700
Brucona	0.193	1.722	0.589
Corona	0.230	1.694	0.561

Nutrient Film Technique Culture of Greenhouse Peppers

Two cultivars of peppers were seeded on January 24. Cultivars 'Golden Boy' and 'Herpa' were then transplanted into rockwool cubes. Plants were placed in NFT channels on March 15. Harvesting began on May 13 and the crop was terminated on August 6. Plants were grown with minimum day and night temperatures of 20°C. Plants were slow growing and very low yielding although quality of the fruit was high. At this time, it appears uneconomical to grow peppers commercially. Work will continue in sweet pepper production especially on the effect of humidity.

GREENHOUSE ORNAMENTAL CROP PRODUCTION - G. Grant and C. Hill

A cultural trial was begun on November 1 with six alstromeria cultivars. Plants will be assessed for yield, flower quality, and duration of flowering. The six cultivars are: Alsaan, Olympic, Red Valley, Sweetheart, and Valeria.

Effects of Loose Rockwool on Plant Growth Components of Poinsettia Plants

The poinsettia cultivars 'Annette Hegg Red' were transplanted on August 4 into 14-cm pots containing a peat:vermiculite mix or loose rockwool. Minimum day and night temperatures were maintained at 18°C approximately 6 weeks after transplanting. There was no difference in onset of bract development or maturity. Plants were mature, i.e. in a marketable state, by November 25. No growth regulators were used on the crop. Data were collected on top fresh mass, top dry mass, and root dry mass 1 month after transplanting.

Initially root growth was slower in the loose rockwool. Roots in the peat/vermiculite mix reached the sides of the pot 10 days ahead of plants in the loose rockwool. There was no significant difference between growth components except for shoot fresh mass (significant at

$P \leq 0.10$). This was probably due to better water retention in the peat/vermiculite mix. At this time, there appears to be no advantage to using loose rockwool to improve the production of poinsettia.

Table 6. Growth characteristics of 'Annette Hegg Red' poinsettia grown in two artificial mixes

Growing media	Average weight of fresh stems (g)	Average weight of dried stems (g)	Average weight of dried roots (g)	Shoot:Root ratio
Loose rockwool	10.210	3.360	10.788	0.317
Peat/vermiculite	14.319	3.380	9.546	0.355

ORNAMENTALS PROGRAM

COMMODITY REVIEW - E. B. Casement

The Nursery Trades

Improved sales of nursery stock were experienced by growers and garden centres in Alberta in 1985. Nursery producers suffered considerable losses during the winter of 1984-1985 due to browning of evergreens, especially in the northern part of the province. Losses of overwintered container stock were considerable in some varieties.

Representatives of six nurseries displayed at a trade show which was held during the Montana Association of Nurserymens' Annual Meeting in January, 1985 at Billings, Montana, and also at the Far West Trade Show in Portland, Oregon, in August 1985. These nurserymen are now exporting hardy Alberta nursery stock to the United States.

The Nursery Industry Marketing Committee, in co-operation with the Marketing Services Division of Alberta Agriculture, produced a slide presentation called, "The Alberta Advantage - Hardy Nursery Stock," which is available for nurserymen wishing to promote their products.

WOODY ORNAMENTALS PROJECT - E. B. Casement, N. Seymour, and G. Smith

Arboretum

The permanent display collection of woody ornamental plants was officially named "The Golden Prairie Arboretum" on August 30, 1985. The arboretum now contains 526 different plants (taxa), arranged by types in rows for easy comparison of species and cultivars.

Although cold temperatures during the winter of 1984-1985 killed the flower buds on many taxa, actual damage to wood was light.

Further information on the Arboretum Plant List is available by requesting AHRC Pamphlet 86-1, The Golden Prairie Arboretum.

Hardiness and Evaluation Trials of Ornamentals

The AHRC is one of nine co-operating stations in the three prairie provinces for the Prairie Regional Trials for Woody Ornamentals. This program was instituted in 1958 through the efforts of the Western Canadian Society for Horticulture in an attempt to determine which plants are hardy under prairie conditions. The Agriculture Canada Research Station, Morden, Manitoba, has acted as the co-ordinating unit in the propagation and distribution of material to all co-operators.

Three plants of each entry were planted and are evaluated yearly for winter injury, ornamental value, and growth rate. After 5 years, the results are sent to Morden where data from all co-operating stations are summarized and tabulated. Additional plant materials have been acquired from private plant breeders, nurseries, other research institutions, and native sources.

In 1980 there were 15 entries in the Prairie Regional Trials and a further 22 entries from the following sources:

Bailey's Nurseries, St. Paul, Minnesota	11
Beaverlodge Nursery, Beaverlodge	2
Eagle Lake Nurseries, Strathmore	4
Greenview Nurseries, Calgary	1
The P.F.R.A. Tree Nursery, Indian Head, Saskatchewan	3
Agriculture Canada Research Station, Ottawa	1

(See Table 7).

There were no entries received for the Prairie Regional Trials, in 1985, but two entries were received from nurseries: A Spiraea from Monrovia Nursery, California, and a Thuja from MacHugh Nursery, Washington.

A listing of all woody plants tested at the Center is available by requesting AHRC Pamphlet 86-3 Woody Ornamental Plant Trials.

Regional Woody Plant Test Program

This program was developed in response to an industry request to the Environmental Horticulture Subcommittee of the Alberta Horticultural Advisory Committee.

There are seven test sites in Alberta: Grande Prairie, Edmonton, Lacombe, Bowden, Calgary, Brooks, and Coaldale, mostly on co-operating nursery sites. Five plants each of about one hundred sixty taxa will be planted at each test site over a 7-year period. These plants will be evaluated for hardiness, growth, and ornamental characteristics for a period of 5 or more years. The initial planting was done in the spring of 1983 at Calgary and Brooks and in 1984 at Coaldale. An additional 29 taxa were planted in the spring of 1985 for a total of 104 taxa at the three southern sites.

Details of this program are available from the Director, Alberta Tree Nursery & Horticultural Centre, R. R. 6, Edmonton, AB T5B 4K3.

Table 7. Woody ornamental plants introductions, 1980

Taxa	Source[y]	Recommendation[z]	Comments
Acer rubrum #3385-77	PRT	U	Killed to ground most winters
Acer saccharinum #7313	PRT	U	Killed to ground most winters
Acer saccharinum #7612	PRT	U	Killed to ground most winters
Betula papyrifera 'Chickadee'	BLN	R	Good clean plants
Caragana arborescens 'Walker'	PRT	R	Spreading
Celtis occidentalis #7102	PRT	R	Good small tree
Cornus stolonifera 'Upright'	ELN/CB	R	
Cotoneaster melanocarpa	PRT	R	Many black fruit
Diervilla lonicera	B	T	Kills to snow line some years
Forsythia ovata	ELN	U	
Fraximus pennsylvanica 'Newport'	B	T	Two out of three good plants
Hydrangea paniculata 'Tardiva'	B	T	Kills to snow line
Malus 'Thunderchild'	PRT	R	Good dark leaved flowering crab
Microbiota decussata	GVN	T	Light winter browning
Philadelphus X 'Galahad'	PRT	T	Kills to snow line
Pinus strobus	PRT	MI	Completely eaten by deer
Populus #7657	PRT	R	Good clean poplar
Potentilla fruticosa 'Gold Drop'	B	R	
Potentilla fruticosa 'Gold Finger'	B	R	
Potentilla fruticosa 'Jackmani'	B	R	
Potentilla fruticosa 'Katherine Dykes'	B	R	Very good
Potentilla fruticosa 'Mount Everest'	B	R	White
Potentilla fruticosa 'Primrose Beauty'	B	R	Primrose
Prunus virginiana 'Copper Shubert'	BLN	R	
Rosa X 'Hazeldean'	PRT	R	Clean plants, good bloom
Rosa X 'Morden Cardinette'	PRT	U	Not hardy
Salix alba sericea	B	R	Male selection heavily rubbed by deer
Thuja occidentalis 'Carman Columnar'	PRT	MI	Eaten by deer
Thuja occidentalis 'Dwarf'	ELN/CB	MI	Eaten by deer
Thuja occidentalis 'Intermedia'	PRT	MI	Eaten by deer
Thuja occidentalis 'Nana'	ELN/CB	MI	Eaten by deer
Ulmus Davidiana japonica 'Jacan'	PRT	R	Some tip kill most years
Ulmus Davidiana japonica #N51	IH	U	Died out
Ulmus Davidiana japonica #N58	IH	U	Died out
Ulmus Davidiana japonica 'Thompson'	IH	T	Two died
Weigela X 'Pink Delight'	B	T	Dies to snow line but blooms each year
Weigela #K18	OTT	T	Dies to snow line but blooms each year

[y]
B - Bailey's Nurseries, St. Paul, Minnesota
BLN - Beaverlodge Nursery, Beaverlodge, Alberta
CB - Valley Nursery, Helena, Montana
ELN - Eagle Lake Nurseries, Strathmore, Alberta
GVN - Greenview Nurseries, Calgary, Alberta
IH - P.F.R.A. Tree Nursery, Indian Head, Saskatchewan
OTT - Research Station, Ottawa, Ontario.
PRT - Prairie Regional Trials for Woody Ornamentals

[z]
R - Recommended for the Brooks area
T - Worthy of trial in the Brooks area
U - Unsatisfactory
MI - More information is needed before making a recommendation

Roses

Severe winter injury was recorded on most of the hardy shrub roses, with only 14 of 101 shrub roses in the collection being injury free. Irrigation was applied early because both May and June were hot and dry, and a reasonable display of bloom was achieved on all types. In the fall of 1985, a trial was set up to test the various overwintering techniques used on Hybrid-T roses. Nine Hybrid-T roses and three selections of shrub roses received from Ottawa in 1985 were added to the collection.

NURSERY PRODUCTION PROJECT - E. B. Casement and N. Seymour

Propagation

Cuttings were taken weekly of 20 different types of plants over a 6-week period starting in the last week of May, both at 6:00 a.m. and at 10:00 a.m. The number of cuttings rooted was tabulated in mid-August. There were no differences in the rooting percentage of the 20 different plants during the 6-week trial, however, there was a highly significant difference between the early and midmorning cuttings with the early cuttings rooting the best.

An additional 5,000 cuttings were taken and stuck for the container trial, the Regional Woody Plant Test Program, and for other trials. An overall rooting percentage of 65 was achieved.

Container Growing

All container grown woody ornamental plants were covered with the industry standard of microfoam and clear polyethylene during the winter of 1984-1985 with no covering over the hoophouses.

A fertilizer/media trial involving three media, three fertility levels, and six types of plants was established using a spaghetti tube system to water each container separately. One part involved 1-year-old cuttings and the second part involved cuttings rooted during 1985. This trial will continue for two growing seasons.

In-Ground Container Trial

This trial, which compares the growth of four different trees (Manchurian ash, Siberian silver leaf willow, Dropmore Mayday, and Tower poplar) in in-ground containers with those growing normally in the soil, was established in 1984. The containers are made of a porous fabric which will allow root penetration into the surrounding soil, but not enlargement over about 1 cm, thus forcing a proliferation of roots within the container. The plants grew well in 1985, and there are no apparent differences among the plants growing in the containers and those growing normally in the soil.

ANNUAL AND PERENNIAL FLOWERS PROJECT - E. B. Casement, R. Rumney, and G. Smith

All-America Selection Annual Flower Trial

There were 41 entries of 19 types of annuals for judging and, 2 award winners among the 90 annuals grown in this trial. The other 47 cultivars were used for comparison of the unnamed selections. Six of the entries were considered superior to their corresponding designated standard cultivar and rated eligible for minimum awards.

Commercial Flower Trial

Seeds of 148 annual flower cultivars were donated by major seed companies to test their performance under local conditions. Bodger, Denholm, Pan American, Ferry Morse, Royal Sluis, Goldsmith, and Sluis and Groot seed companies donated seed.

The most outstanding cultivars were: salvia cv Rodeo from Royal Sluis and marigolds cvs Lion Eyes and Tiger Eyes from Ferry Morse seed company.

Perennials

Chrysanthemums - There was significant loss in the chrysanthemum collection over the past winter with two cultivars (Susan Brandon and Golden Regards) being lost completely. Two plants each of the remaining cultivars were dug and stored in the cooler for rejuvination and replanting in the spring of 1986.

Iris - The iris collection suffered some loss over the past winter but no cultivars were lost completely. The healthy plants bloomed well in late May and early June.

Peony - There was no loss over the past winter. The earliest to bloom was the fern-leaf peony on May 24, while the main collection flowered in mid-June.

Lilies - Little or no loss was recorded due to winter injury. The first blooms were observed in late June and a good show of colour was enjoyed until late July.

Gladioli Collection

All corms were dipped in a solution of Benlate, Captan, and sulphuric acid prior to planting to control diseases. After planting the area was sprayed with Chloropropham to control the weeds. No new cultivars were added in 1985.

TREE FRUIT PROJECT - E. B. Casement (S. Mahadeva)

Due to the downsizing of the program, only general maintenance was carried out in the orchards. Pruning was done as required for training and removal of winter injury and to control sucker growth and fireblight. In general, apples, pears, and, plums yielded poorly due to harsh weather conditions and damage done by deer.

Apple and Pear Variety Orchard

The plot was maintained and trickle irrigation has been installed in the rows. Some trees on the west side of the plot exhibited fireblight infection. Bourdeaux mixture was applied and pruning was done to help control this problem. The crabapples and applecrabs produced well but the late, mid, and early season apples yielded poorly, and the pears did not bear fruit.

Commercial Orchard

Trickle irrigation was also installed in this orchard. The plot was kept under clean cultivation with herbicides sprayed in the rows. There were a few requests for scion wood and cuttings were taken in late July and early August. Few of the trees produced fruit, mainly due to the immaturity of the plants. A few selected cultivars were field budded in early August onto some established rootstock.

Plum Orchard

The spring planted Missouri currants and Nanking cherries established well. Dandy produced the most fruit of the plum cultivars, although yields were low. The apricots did not produce fruit this season.

NATIVE AND BUSH FRUIT PROGRAM

COMMODITY REVIEW - L. Hausher

Commercial saskatoon plantings continued to increase in area, and, as young orchards come into production, steady increases in production are realized. Planted area was estimated at 220 ac (90 ha) in 1985.

Unseasonable snow and extreme cold temperatures during the early fall of 1984 damaged raspberry plants throughout the province. All raspberry plantings at AHRC were killed to ground level. There are no trial results available 1985.

SMALL FRUIT CULTURE AND CULTIVAR IMPROVEMENT - L. Hausher, (S. Mahadeva), and T. S. Pih

Evaluation of Strawberry Cultivars for Yield and Winter Hardiness

June-Bearers - Winterkill ratings indicated highly significant differences among the five cultivars tested in matted-row culture. Protem and Senga Sengana received average ratings of 1.25 and 1.50 respectively, out of 10. A zero rating indicates no kill, while a 10 rating represents complete winterkill. Two cultivars, Surecrop and Earlidawn were significantly superior to Red Coat. Red Coat, which had a rating of 7.5, was significantly hardier than Surecrop and Earlidawn which had ratings of 8.75 and 9.00 respectively. The marketable yields of Senga Sengana and Protem were significantly better than the remainder, while the total yield of only Senga Sengana was better than that of Red Coat, Surecrop, and Earlidawn.

Everbearers - The cultivar Ogallala had significantly less winterkill than all other cultivars (with a 1.5 rating). The early marketable yield of Ogallala and Jubilee, though only significantly better than Sunburst, were higher than the remaining. Ogallala and Jubilee had significantly greater early total yield. Although Ogallala had a greater total late yield, the cultivar Fort Laramie produced the highest marketable late crop. The cultivar Ogallala significantly outyielded all cultivars in total yield for the season, but the cultivar Fort Laramie had the highest marketable yield.

New Cultivars - Nine cultivars of strawberries were grown in replicated blocks with Ogallala as the standard. One set of blocks was mulched with straw during winter months, the other was not protected. The cultivar Glooscap had the highest marketable and total yields in the unprotected blocks. Glooscap had significantly higher yields than all cultivars with the exception of Kent and Bounty. The cultivars Bodgerbelle and Ogallala had significantly higher winterkill than other cultivars.

In mulched plots the cultivars Glooscap and Ogallala significantly outyielded all other cultivars in total yield. The best

yielding cultivar Glooscap significantly outyielded all cultivars except Micmac in total marketable yield.

Winter injury was relatively minor, with Ogallala being significantly the hardiest cultivar receiving no measurable signs of injury, while the cultivar Bodgerbelle had the highest rating for winter injury.

Evaluation of Forty-Six Strawberry Seedlings in Matted Row Culture

Two replications of each seedling were planted in rows 1.5 m apart and allowed to develop into a matted row. A 2-meter section of each row was harvested for evaluation. Four seedlings yielded over, 2½ lb per 3 ft (1 kg/1 m) row.

Effects of Winter Protection on Redcoat Strawberry Winter Hardiness and Yield of Redcoat Strawberry

Redcoat plants, established in 1982, were grown on a matted row system with rows 1.5 m apart. Protective coverings included 10-cm deep straw mulch, 15-cm deep straw mulch, a thermoblanket, translucent white polyethylene, and black polyethylene. An uncovered check served as a control. The mulches were laid during the third week of November. In this, the third year of the trial, there was no significant differences in winterkill among treatments. Total yields for 1985 were also not significantly different, although the straw mulches appeared to have detrimental effects.

No significant yield differences were observed among the five treatments and the control when data from all 3 years was analysed.

Influence of Polyethylene Tunnels on Earliness and Total Yield of Three Strawberry Cultivars

The advanced selection of June-bearing strawberry BB40, and the cultivars, Senga Sengana and Redcoat, were established in May, 1982 in a replicated trial to study the effect of polyethylene tunnels on earliness and total yield of fruit. Rows were spaced 1.5 m apart and allowed to develop into a matted row.

Wire loops were erected in the autumn of 1984 prior to the ground freezing. A clear perforated polyethylene cover (40 microns) was placed over the wire loops on April 15 and removed on June 10, 1985.

Winter injury rating at the time of tunnel cover placement revealed that Senga Sengana with and without tunnel suffered significantly less winterkill than the remaining four treatments. The cultivar Redcoat exhibited the greatest winter injury. Total yield of Redcoat, both with and without a tunnel, was significantly lower than the other treatments except for BB40 with no tunnel. All cultivars exhibited an increased yield under tunnels, although these increases were not significant.

The total yields of all treatments were analysed for the 3 years of the trial. Senga Sengana under tunnels significantly outyielded the other treatments with the exception of BB40 with tunnel. Redcoat with and without tunnels exhibited lowest total yields.

BUSH AND NATIVE FRUIT CULTURE AND CULTIVAR IMPROVEMENT - L. Hausher, (S. Mahadeva)

Evaluation of Ribes Cultivars for Yield Potential

Red Currants - Fruit was harvested from single bushes chosen at random. Two bushes of each cultivar were harvested and average yields determined. The cultivar Red Cross yielded 1.2 kg of fruit per bush, while the cultivars Cascade and Perfection yielded 0.9 kg per bush.

Black Currants - Average yields were determined from harvesting two bushes of each cultivar. The cultivar Kerry produced a yield of 2.3 kg per bush, followed by Boskoop (2.0 kg) and Buddenborg (1.8 kg).

Gooseberries - Average yields were determined from harvesting four bushes of each cultivar. The cultivar Pembina Pride produced a yield of 3.0 kg per bush, followed by the selection M525 with an average 2.3 kg per bush while Pixwell, Welcome and Parkside all produced yields of 1.9 kg per bush.

Evaluation of Five Cultivars and Three Selections of Sandcherry for Yield and Fruit Quality

Single bushes were chosen at random for harvest from three rows. Average yields per bush were then calculated. The cultivar Mando produced an average yield of 1.2 kg per bush, with the selection CH9-11-19 following with a yield of 1.0 kg of fruit per bush. The remaining selection and cultivars produced less than 0.4 kg of fruit per bush. Only one bush was harvested from the cultivar Ellen with a yield of 2.8 kg of fruit.

Evaluation of Saskatoon Cultivars

Three bushes of six cultivars from each of four replicates were harvested for evaluation. The cultivar Northline significantly outyielded the cultivars Smoky, Moonlake, Honeywood, Thiessen, and Forestburg. Forestburg was the poorest producing cultivar. The average yield of Northline was more than double that of the other cultivars.

MARKET GARDEN PROGRAM

The market garden research and extension program is designed to test vegetable cultivars for their suitability for Alberta conditions, and to develop and evaluate potential cultural techniques to improve yield, quality, and earliness of market garden crops. Trials are conducted at several locations varying in soil and climatic conditions.

In 1985, trials were conducted at Brooks and Edmonton. In this report, only summaries of cultural and cultivar evaluations conducted at AHRC are given. Detailed information about these trials is available by requesting AHRC Pamphlet 86-4, Vegetable Cultural Trials - 1985 and AHRC Pamphlet 86-5, Vegetable Cultivar Trials - 1985. Results of the Edmonton trial are reported in The Alberta Tree Nursery and Horticulture Centre (ATN & HC) Annual Report. Also, the colleges at Olds, Fairview, and Vermilion conducted vegetable cultivar trials in co-operation with AHRC. Detailed results of these trials are also available from the ATN & HC at Edmonton.

COMMODITY REVIEW - L. Hausher

Market garden fruit production is made up primarily of strawberries and raspberries, the majority of which is sold on a 'pick-your-own' basis. In 1985, approximately 99 ac (40 ha) of strawberries were grown, with yields averaging 2225 kg/ac (5000 kg/ha). Commercial raspberry production was about 49 ac (20 ha), but yields were very poor as most raspberry plants in Alberta were killed to ground level during the winter of 1984-85.

Production of market garden vegetable crops has increased once again, and is estimated at 1800 ac (728 ha). The number of market gardeners (those selling direct to consumer) was estimated at 350 and their estimated farm gate income exceeded 6 million dollars. In November, 1984, the market gardeners in Alberta formed the Alberta Market Gardeners' Association to represent the needs and concerns of their industry. In the fall of 1985, they held their first annual convention and trade show. The Association operated a toll-free consumer information line during the summer months which proved beneficial for members.

Farm-gate and farmers'-market prices remained quite stable throughout the year, with only marginal increases in some commodities from previous years. Average yields were obtained from southern producers with the exception of cucumbers. Due to the cool August, production of cucumbers throughout the province was very low. Producers in central and northern areas also had problems with drought in the early summer, further delaying cabbage and corn crops.

Prospects are for a further increase in market garden production for 1986.

PROTECTED FIELD VEGETABLE PRODUCTION PROJECT - L. Hausher and M. Briant

Evaluation of Polyethylene Mulch and Tunnels on Vegetable Crops

Black and clear polyethylene mulches (40 microns thick) alone and in combination with perforated, polyethylene tunnels were evaluated for their effect on yield and earliness of vine crops against the standard (control) practice of planting in bare soil without a tunnel.

Summer Squash - 'Zucchini Select' grown on bare soil with a tunnel and with black mulch alone, had the highest production. Squash grown on the black mulch matured 3 days earlier than all other treatments.

Winter Squash - 'Golden Hubbard' grown on black mulch with a tunnel had the highest marketable yield, nearly double that of the control.

Pumpkins - 'Spirit' grown on black mulch with a tunnel out yielded all other treatments.

In 3 years of pumpkin trials, the black mulch and tunnel treatment was superior both in yield per plant and total yield per hectare. Yields were increased 86 percent over standard growing methods.

Effect of Timing of Tunnel Removal on Yield and Earliness of Cucumbers and Peppers

Cucumbers and peppers were planted in black ground mulch and covered with perforated clear tunnels. The first tunnel removal was started at the first sign of crop bloom. Thereafter, another tunnel was removed every 3 days until all the eight or nine removal treatments were completed.

Maximum fruit yields of Earlipik cucumber were obtained when the tunnel was removed at first sign of bloom. Earliest maturity was obtained when the tunnel was removed during the first 3 days of bloom.

Three years of evaluation have shown than to obtain maximum yield of pickling cucumbers grown on mulch with tunnels, the tunnels should be removed within 9 days of the first sign of bloom.

Maximum yields of Early California Wonder green pepper were obtained when the tunnel was removed 3 days after first sign of fruit bloom.

Three years of evaluation have shown that highest yields of peppers were obtained by removing the tunnels during the first 12 days of bloom.

Effect of Tunnel Opening on Yield of Cucumbers

Slicing cucumber (cv Slicemaster) and pickling cucumber (cv Earlipik) were grown on both black polyethylene mulch covered with tunnels and bare soil (no mulch) covered with tunnels. Three tunnel opening methods on each treatment were studied; a) opening only the south side of the tunnel; b) spreading the tunnel apart down the center, but pinning the sides of the plastic up; and c) complete removal of the tunnels at the time of first bloom.

Slicers - Removing the entire tunnel resulted in the highest yields of Slicemaster grown on both black plastic and bare soil.

Three years of trials indicate that there are no significant differences in yield among the different opening methods.

Picklers - Removing the entire tunnel resulted in the highest yields of Earlipik grown on both black plastic and bare soil.

Three years of trials indicate that there is no significant yield difference among the different opening methods.

Effect of Tunnel Hole Placement on Yield of Cucumbers

Six different spacings and placement of ventilation holes in the plastic tunnel were studied on cultivar Earlipik planted in black polyethylene mulch. A commercially available slitted plastic was also included. The treatment in which the ventilation holes were placed 15 cm apart significantly out yielded all treatments except the treatment in which holes were placed along the bottom of the tunnel. The standard treatment (20 cm), and the treatment with holes on the top half of the tunnel maintained warm temperatures better than other treatments.

Reemay - Mulch and Tunnel Comparison

A trial comparing a new spunbonded fiber row covering (Reemay) with mulch and tunnel growing methods was established. Five treatments were studied; black and clear mulches with tunnels; Reemay used as a floating mulch over seedlings; Reemay used as a tunnel over seedlings and bare soil as check. The trial was carried out on Early California Wonder green pepper and Spirit pumpkin. Soil and air temperatures were recorded.

Peppers - The mulch and tunnel treatments significantly outyielded both Reemay treatments and the check. Reemay, as a floating mulch, damaged transplant seedlings when blown by winds. Air temperature was increased by Reemay, but was lower than tunnel treatments.

Pumpkin - The black mulch and tunnel treatment significantly outyielded all other treatments. No significant differences were

observed between the check treatment and Reemay treatments. The floating Reemay caused injury to the pumpkins in the seedling stages. Air temperature was increased under the Reemay.

Plant Protection Systems - Temperature Monitoring

A trial was established to monitor soil and air temperature under modified growing systems. Commercially available hot caps, Wall-O-Water (water filled plastic tent), mulches, and tunnels were evaluated. Temperature recordings commenced April 11 and continued to May 18. On a cold day, when outside air temperatures dipped below freezing, air temperature inside the Wall-O-Water remained above freezing, while in the other treatments, including the hot cap, temperatures dipped below freezing. In general, tunnel treatments were approximately 2°C colder than other treatments when ambient temperatures were below freezing. At sunrise temperatures in tunnel treatments rose more rapidly than other treatments. Soil temperatures of all treatments remained higher than outside soil temperature.

On a warm day, air temperature in all treatments remained generally higher than outside air temperature. Soil temperature inside the hot cap and Wall-O-Water did not warm up as rapidly as outside soil temperature. During early morning hours, soil temperatures of all treatments remained higher than outside soil temperature.

Effect of Plant Density on Yield and Earliness of Cucumbers

Single and double row seedings of Earlipik cucumbers were evaluated on bare soil, black mulch, and black mulch with tunnel. The best yields were obtained from the mulched rows with one seeded row of cucumbers. Early yield was greatest from the single row seeded on black mulch with a tunnel.

Early Forced Production Trial

Sweet Corn - Clear and black polyethylene mulch was laid in the field in the fall of 1984. On April 29, 1985 Northlite sweet corn was seeded in double rows, at 30 cm spacings, on mulch, and covered with clear perforated polyethylene tunnels. Both dry seed and pre-germinated seed were planted. On May 7, Northlite was again seeded on the different mulches and covered with tunnels, to correspond to regular corn seeding date. Sweet corn seeded April 29 on mulch and tunnels was mature on July 23. Corn grown on clear mulch yielded greater in the first two harvests than that grown on black mulch. Pregerminated seed produced higher yields than dry seed. Sweet corn thinned to two plants per hill gave better yields than one or three plants per hill. Northlite seeded May 7 in mulch and tunnels was mature on August 1, while Northlite seeded in bare soil on May 6 was mature on August 13.

Direct Seeding - Tomato, Watermelon, Muskmelon, Pepper, Pumpkin

Dry seed, pre-germinated seed, and transplants were evaluated in both black and clear mulch. All rows were covered with tunnels. All seeding and transplanting were done on May 13 and tunnels were erected over rows immediately after.

All crops produced highest yields from transplants; however, pre-germinated watermelon (cv Yellow Baby) and pre-germinated muskmelon (Northern Queen) yielded well.

VINE CROP CULTIVAR PROJECT - L. Hausher and M. Briant

Slicing Cucumber - The highest yielding of the sixteen cultivars evaluated was Monarch while the earliest maturing was Dasher II.

Pickling Cucumber - The F1 hybrid 'Regal' was one of the earliest of the 17 cultivars tested and had the highest yields. After 3 years of evaluation in the advanced trial, Tempo has significantly outyielded the other five cultivars, including the standard Earlipik.

Muskmelon- The highest yielding cultivar, Early Dawn, significantly outyielded all cultivars but Alaska. After 3 years of evaluation, no significant yield differences were observed among the five large fruited cultivars. Alaska and Northern Queen were the earliest maturing.

Summer Squash - The cultivars Green Magic and Smoothie were the highest yielding of the 20 cultivars evaluated. Most cultivars matured at the same time.

Winter Squash - The cultivars Baby Hubbard and Vegetable Spaghetti outyielded the other 12 cultivars of winter squash. Four cultivars, primarily butternut types, did not mature.

Pumpkin - Of the eight cultivars evaluated, only Spirit and Jack Pot produced mature fruit.

SOLANACEOUS CULTIVAR PROJECT - L. Hausher and M. Briant

Peppers - Thirty-seven cultivars were evaluated in the screening trial. Eleven cultivars outyielded the standard Early California Wonder in the bull-nose class, with MaBell having the highest yield. All three cultivars outyielded the standard Castle in the pointed class. Fry King and Coronado Hot outyielded Hungarian Yellow Wax in the long-pointed class. Most cultivars had mature fruit 82 days after transplanting.

In the advanced trial, the cultivar Canape outyielded the standard Early California Wonder and the remaining nine cultivars.

After 3 years of evaluation, the cultivars Lady Bell and Bell Boy have outyielded the standard Early California Wonder.

PERENNIAL VEGETABLE PROJECT - L. Hausher and M. Briant

Asparagus Cultivar Trial

Of the 16 cultivars evaluated, Rutgers Hybrid 204 had the highest yields in the total 7 harvests.

Rhubarb Cultivar Trial

Two harvests were made in this, the third year, of the trial. The highest yielding cultivar German Wine (white) had a total yield of 21.8 t/ac (49 t/ha).

Vegetable Display on Field Day
(Carroll Photo-Graphics)

VEGETABLE PROGRAM

Details of all cultivar and cultural trials are reported in AHRC Pamphlet 86-4 Vegetable Cultural Trials 1985 and AHRC Pamphlet 86-5 Vegetable Cultivar Trials 1985. Both pamphlets are available upon request.

COMMODITY REVIEW - P. Ragan

Wet spring weather delayed seeding in most areas of the province. Good but dry growing conditions prevailed through to July. In August and September, persistent rain hampered harvest and cold temperatures reduced growth of fall crops. Only the Peace region remained dry. Despite the weather, all crops were harvested with the exception of most storage cabbage which failed to size-up adequately.

Table 8. Commercial vegetable crop production figures for Alberta, 1985 vs. 1984.

	Crop	Acres (Hectares)			
		1985		1984	
		ac	(ha)	ac	(ha)
Fresh	Cabbage	845	(338)	541	(216)
	Carrots	969	(387)	624	(250)
	Sweet Corn	810	(324)	350	(140)
	Onions	207	(82)	146	(58)
	Rutabaga	270	(108)	100	(40)
	Parsnip	47	(18)	10	(4)
	Pumpkin/Squash	110	(44)	100	(40)
	Others	671	(270)	283	(113)
	TOTAL	3929	(1571)	2154	(861)
Processing	Peas	4026	(1610)	3647	(1458)
	Beans	360	(144)	365	(146)
	Corn	2400	(960)	--	--
	Carrots	55	(22)	15	(6)
	Red Beets	30	(12)	22	(8)
	TOTAL	6871	(2748)	4049	(1618)

Above average yields for most processing crops were obtained. Delay in maturity occurred in late seeded peas and corn. Only minor acreages of corn were lost due to frost and rain in September.

PROCESSING CROP CULTIVAR PROJECT - P. Ragan and T. Maruno

Testing of named cultivars and advanced seedings in both peas and snap beans continued with 74 cultivars on trial. Improvements appear mostly in peas with earliness in the cultivars Spring, Fridgit, Tilma, and Sunset. The semi-leafless characteristic is also becoming more common in peas.

FRESH VEGETABLE CULTIVAR PROJECT - P. Ragan and T. Maruno

A total of 365 cultivars of cabbage, cauliflower, broccoli, sweet corn, tomatoes, carrots, onions, and chinese cabbage were grown. Cultivars new on the market and worthy of mention include the following:

cauliflower - White Fox, White Rock, Andes, and White Sails all are heat tolerant and are good wrappers;

sweet corn - Spring White was an exceptionally early-maturing white corn of high quality;

tomatoes - Quinte was an early-maturing cultivar of medium-sized fruit;

carrots - Orlando Gold as an imperator type has a striking orange color but root length may be too long, Frantes, Nangro and Vita Sweet were exceptionally high quality coreless cultivars;

onions - both Norstar and Eskimo continue to be high quality early maturing cultivars.

PROCESSING VEGETABLE CULTURAL PROJECT - P. Ragan and T. Maruno

Wax Bean Population Trial

There was a significant increase in yield as spacing between plants in the row decreased. This yield increase was not characterized by any significant response in pod sieve size distribution except for yield of sieve size two pods (a grading standard for wax beans) which was less as plant population increased.

Processing Corn Population Trial

There was no significant reduction in yield as plant population increased, however, the slight decline in yield that did occur was the result of significant reductions in both cob length and average number of cobs per plant. Corn heat unit requirement of 2138 to first harvest was the same for all treatments.

Processing Corn Succession Seeding Date Trial

Maturity in processing corn generally required fewer heat units with later sowing dates. Yield declined significantly with later sowing and this was largely attributed to the the significant reduction in number of cobs per plant. Cob length was not affected by sowing date.

FRESH VEGETABLE CULTURAL PROJECT - P. Ragan and T. Maruno

Carrot Nitrogen Fertilizer Trial

No consistent trends were evident in grade and total yield at either the early or late harvest in response to three nitrogen treatments.

Onion Nitrogen Fertilizer Trial

There was a significant delay in maturity as the application rate of nitrogen fertilizer increased. Application of nitrogen during the growing season, as opposed to a preplant application, delayed maturity the most. Neither rate nor timing of nitrogen application had a significant effect on yield and bulb size. Nine treatments were included in this trial.

Carrot Succession Seeding Date Trial

A significant increase in yield of #1 grade roots and total yield occurred with earlier seeding. The highest total yield and yield of #1 grade roots was produced in a late May seeding. A total of five successive seedings were made at 10 day intervals.

Cauliflower Population Trial

Maturity in cauliflower was significantly delayed as in-row spacing decreased and between-row spacing increased. In-row spacing appeared to have the greater effect on crop maturity. Yield did not respond significantly to nine plant population treatments and no clear yield x plant population effect was evident. Curd (head) size was significantly smaller as in-row spacing decreased and also smaller as between-row spacing decreased.

Broccoli Population Trial

In nine treatments, plant population failed to have a significant influence on maturity of broccoli. Yield was significantly higher as both in-row and between-row spacings decreased; the yield increase was most influenced by in-row spacing. Head size in broccoli was not significantly affected by plant population.

POTATO PROGRAM

COMMODITY REVIEW - C. Schaupmeyer

There were 23,820 acres (9,644 ha) of potatoes planted in Alberta in 1985, compared with 20,657 acres (8,363 ha) in 1984 and an annual average of 14,995 acres (6,071 ha) from 1978 to 1982. Approximately 1500 acres (600 ha) were not harvested due to unusually early cold and snowy weather in October. A total of 220,000 t of potatoes were harvested giving an average gross yield of 9.2 t/ac (22.7 t/ha). Hot weather in July caused some second tuber growth. Wet, cool weather in August delayed maturity, and cold weather in September and October caused some severe frost damage. Storability and processing quality of some crops were affected.

POTATO CULTIVAR IMPROVEMENT PROJECT - C. Schaupmeyer, G. Feth, D. Curry, T. Smyrl, M. Dench, J. Hung, and D. Lynch

The Alberta Horticultural Research Center is one of five prairie agencies that co-operate in the Prairie Potato Regional Trials. Dr. D. Lynch, Agriculture Canada, Lethbridge, is the co-ordinator of the trials and is the prairie potato breeder.

Lines received by AHRC go through two stages of testing: adaptation trials and advanced replicated trials. Seedlings are observed in the adaptation trials for up to 3 years and those that show yield and quality potential are entered into either the Prairie Replicated Trial (maincrop) or the Prairie Early Replicated Trial (early). The main criteria used for evaluation of seedlings include yield, appearance, processing and culinary quality, and specific gravity. Between 30 and 40 observations are recorded for each seedling or cultivar depending on the trial.

In addition to the Prairie Replicated Trials, AHRC co-operates in the North Central Regional Trial co-ordinated by Dr. R. Johansen of Fargo, North Dakota. Promising seedlings from this trial are advanced to the Prairie Replicated Trials after 1 to 3 years of testing.

As well as being a trial co-operator in the Prairie Potato Regional Trials, AHRC produces seed for the trials.

A change was made in the program in 1985. Because data necessary for licencing is generated in the Regional Trials, it was felt that the effort put into the block trials could be better directed. Six 'graduates' of the Regional Trials were put into a commercial cultivar evaluation plot. Processors viewed the plot on August 20, 1985, and on the basis of processing performance and appearance, processors selected cultivars for trial in 1986. The majority of each plot was retained for seed for the 1986 field trials. The six numbered selections were: F74123, W848, W844, Min 9632, F76080, and A68710-5.

The complete report of potato cultivar trials, AHRC Pamphlet 86-7 - Potato Cultivar Trials 1985, is available upon request.

Prairie Replicated Trial (Maincrop)

This trial evaluates promising mid- and late-maturing seedlings previously tested in the adaptation trials or the North Central Trials. Data required for licensing are collected in this trial for up to 3 years. In 1985, 26 cultivars were compared with the standard cultivars, Russet Burbank, Norchip, and Norland. The trial was planted on May 8 and harvested on September 30 and October 1. Extensive pre-harvest, at-harvest and post-harvest data were collected for seedling evaluation. All entries were French fried and those designated as chippers were chipped. One third-year seedling, W843, was baked and boiled.

A75195-2 had an acceptable appearance and fair French-fry score. It has potential as a long russet-type table potato with possible French-fry use. Of the chippers tested, Wis 74-7 and W847 appear to be the most promising, having had good appearance, high yields, and light chip colors.

The red types were compared with Norland. Of these, ND656-1 was the best, but not as good as Norland.

Prairie Early Replicated Trial

This trial evaluates promising early maturing seedlings, previously tested in the Adaptation Trials, for suitability for early table market and early chipping. This data is used for licensing. Ten seedlings were compared with the standard cultivars Norland, Carlton, Norchip, and Superior.

The trial was planted on May 7 and first harvest on July 30 and 31. The second harvest was on August 13 and 14. Samples of all lines were chipped within 1 day of harvest.

F77001 had a very high first-harvest yield, but glycoalkaloids were high. If retained, these levels will have to be verified. Wisc 74-36 had a good chip score and fair yield on the second harvest.

North Central Regional Potato Trial

Seventeen seedlings were compared with five standard cultivars, Red Pontiac, Norland, Norgold Russet, Norchip, and Russet Burbank.

Eight seedlings designated as chippers were compared with Norchip. ND651-9 performed well and was ranked second out of the 22 entries. ND860-2 may be recommended for licensing because of its excellent chip color out of cold storage. This seedling has also appeared in the Regional Trials and was initially recommended for discarding due to low yields. If this variety is licensed because of

superior chip color, processors will have to offer a bonus or other incentive to compensate for low yields.

Five seedlings were unclassed. Of these, M5716-15 had high specific gravity and fair yield and was ranked fifth in overall performance.

Two russeted seedlings were compared with Norgold Russet and Russet Burbank. ND671-4 Rus had good appearance but low yield; MN11816 had good yield but only fair appearance.

Of the two red types that were compared with Red Pontiac and Norland, only W949R performed well, having a high yield and fair appearance.

Prairie Adaptation Trial

Dr. D. Lynch, the Prairie Potato Breeder, evaluates seedlings from various North American breeding programs for up to 5 years. Selected seedlings then enter the Prairie Potato Regional Trials at five locations in Alberta, Saskatchewan, and Manitoba.

The Prairie Adaptation trials are comprised of three separate trials each representing an additional year of testing. First year entries are entered in the Prairie Adaptation Trial. Retained seedings enter the PAT Level I (second year), and third year seedlings enter the PAT Level II (third year). There were 120 first-year, 70 second-year, and 72 third-year entries in 1985. Disposal of these entries is decided at the Prairie Potato Regional Trial annual meeting in February.

POTATO PRODUCTION IMPROVEMENT PROJECT - C. Schaupmeyer, G. Feth, D. Curry, T. Smyrl, M. Dench, and J. Hung

Effects of Alar (daminozide) on Tuber Set and Tuber Size of Four Potato Cultivars

Alar has been reported to increase tuber set and reduce tuber size. This may be useful for seed growers who require more uniform, smaller tubers.

Alar was applied to Russet Burbank, Norland, Norchip, and Norgold Russet potatoes at 0.55 g in 220 mL of water per 5.5 m^2 plot. Two treatments were compared with an untreated check. The treatments included application at tuber initiation (when tubers were less than 10 mm in diameter), and application when tubers were 20 mm in diameter.

Harvested tubers were weighed, counted, and sorted into lots as follows: 30-50 mm, 50-70 mm, 70-90 mm, and greater than 90 mm diameter. Samples of all tubers were retained for determination of sprout vigor in March, 1986.

No significant differences in total yield or tuber number were found. There was a trend for the late application of daminozide to increase the number and reduce the size of Russet Burbank tubers.

Effects of Foliar Feeding on Yield and Quality of Russet Burbank Potatoes

Four foliar feed treatments were compared with an untreated check. Plant Products 20-20-20 was applied at 5.13 g/L at 1200 mL per 11 m^2 plot and at 10.3 g/L at 1200 mL per plot. Leffingwells 10-12-0 was applied at 4.12 mL/L at 1200 mL per plot and at 8.24 g/L at 1200 L/plot. All treatments were applied a total of four times on July 8, July 22, August 1, and August 12, 1985.

There was no pre-plant application of fertilizer to the plot area that had been planted to corn in 1984. Soil analysis of plot 43 showed no need for nitrogen fertilizer; however, the testing procedure did not distinguish between small plot areas. Potato foliage in this plot was light colored by the time treatment started and, although no tissue analysis or soil sampling was done, it was assumed nitrogen was deficient.

All treatments had significantly higher total yields than the unfertilized check. The recommended (low) rates of both foliar fertilizers did not result in significantly higher marketable yields than the unfertilized check, but the high rates of both products did. The specific gravity of potatoes from all treatments, except those from the low rate of 20-20-20, was significantly reduced.

Although the high treatments increased marketable yields of Russet Burbank tubers, the site was low in nitrogen and the benefits in yield and economic return need to be compared with conventional spring applications of fertilizer and with fertigation. Where nitrogen is deficient, and when side dressing or fertigation is not possible, foliar feeding might be used to increase nitrogen supply to the plants.

Effects of Maleic Hydrazide on Yield and Quality of Potatoes

Maleic hydrazide, a field-applied sprout inhibitor, was recently implicated in skin quality problems of Russet Burbank potatoes, and Uniroyal Chemical was obligated to warn against its use on Russet Burbank potatoes grown under irrigation. To test the effects of maleic hydrazide (Royal MH60SG), four trials were planted: one at AHRC and the others on commercial growers' fields in the Taber area. Five treatments of Royal MH60SG were used in the AHRC trial: 2.3 kg/ac (5.7 kg/ha) MH60SG applied on July 25 and August 10; 4.6 kg/ac (1.9 kg/ha) MHG0SG applied on July 25 and August 10; and MH60SG new formulation. These were compared with an untreated check.

No significant differences in yield or quality were observed in Russet Burbank. No elephant hide or stem-end cracking were observed. Although not significant, the marketable yield of Norchip

was 16 percent lower when the high rate of MH60SG was applied on July 25, compared with the average yield of the other four treatments and the check.

No elephant hide or stem-end cracking was observed on Norchip; however, some growth cracking was recorded in all treatments.

Samples of Russet Burbank from all treatments were stored at 6°C, and samples of Norchip from all treatments were stored at 10°C and will be evaluated for sprouting on April 1, 1986.

Three treatments were applied to plots in three commercial Russet Burbank fields in a randomized complete block design. The treatments were 2.3 kg/ac (5.7 kg/ha), 4.6 kg/ac (1.9 kg/ha), and a check. Treatments were applied on August 6 and all plots were harvested on September 19, 1985. Because of the variability of stand among plots, the yield data were not statistically analyzed; however, there were no apparent yield differences between treatments. No elephant hide or stem-end cracking was observed.

Samples from each treatment were analyzed for maleic hydrazide residue. Residues from the 2.3 kg/ac (5.7 kg/ha) treatment ranged from 4-16 ppm and from 15-45 ppm from the 4.6 kg/ac (1.9 kg/ha) treatments. Accepted tolerances are 50 ppm.

Commercial Seed Piece Trial

Samples of cut seed ranging in size from 10-15 kg were taken from five Russet Burbank and five Norchip cut-seed lots in southern Alberta to determine the distribution of cut pieces and compare yield performance. Each sample was sorted into whole pieces, single-cut pieces, two-cut pieces, three-cut pieces, four-cut pieces, and waste. Proportions of seed piece types and average seed piece weights for the ten lots are shown in Table 9.

The average weight of the Russet Burbank pieces ranged from 48 g to 73 g and averaged 52 g. The average weight of Norchip ranged from 56 g to 66 g and averaged 63 g. These average above the currently recommended minimum of 50 g. Only one sample had no two-or-more cut pieces; however, two other samples had low portions of two-cut pieces and no three-or-more cut pieces.

Based on the distribution of seed piece types, 20-piece lots were reconstructed from the sorted samples. These were planted in a four-replicated, randomized complete block design. The potatoes in the plot were frozen before harvest and marketable yields could not be compared. Total yields and tuber numbers were analyzed; however, no significant differences were found among seed samples. Uncontrollable variables such as seed sources and pre- and post-cutting handling may have influenced seed lot performance.

Table 9. Percent by number and average weight of seed piece types for Russet Burbank and Norchip potatoes sampled from ten grower cut-seed lots.

Cultivar	Sample	Av Piece Wt (g)	Whole Pieces %	Whole Pieces wt (g)	One-Cut Pieces %	One-Cut Pieces wt (g)	Two-Cut Pieces %	Two-Cut Pieces wt (g)	Three-Cut Pieces %	Three-Cut Pieces wt (g)	Four-Cut Pieces %	Four-Cut Pieces wt (g)	Waste (wt) %
Russet Burbank	1	50	30	57	70	46	0	-	0	-	0	-	<1
	2	53	10	65	46	49	19	44	25	45	0	-	<1
	3	65	67	73	30	55	3	50	0	-	0	-	0
	4	59	3	30	33	67	53	52	11	63	0	-	0
	5	48	8	67	37	48	29	37	25	38	0	-	9.3
	Mean		22	66	44	51	21	43	13	45	-	-	
Norchip	6	66	12	70	41	71	41	61	6	66	0	-	<1
	7	65	10	56	44	60	24	59	21	66	<1	-	01
	8	56	1	50	35	59	30	53	29	55	6	46	0
	9	65	2	30	58	61	22	53	17	74	2	50	5.6
	10	73	37	71	41	76	21	70	0	-	0	-	0
	Mean		10	67	44	65	28	58	16	62	2	47	

Russet Burbank sample 5 contained the fewest number of whole tubers, had the lowest average weight, and produced the lowest yield (NS). Seed sample 3 contained the highest proportion of whole tubers, had the highest average seed-piece weight, and produced the highest yields (NS). Norchip sample 10 contained a high proportion of whole and one-cut seed pieces, had the highest average seed-piece weight, and produced the highest total yield (NS).

Other researchers have reported that the ideal seed lot should contain a large portion of single-cut pieces, a few whole tubers, and no two- or three-cut pieces. This observation trial indicates that the majority of growers should have fewer two- and three-cut pieces. The implication is that the majority of seed lots are too variable and have too many larger tubers requiring an excessive number of cuts.

SEED POTATO PROGRAM

COMMODITY REVIEW - J. R. Letal

The seed potato industry has been expanding steadily since 1976 due to an increase in export sales. In 1985, the seed potato growers planted 4140 ac (1675 ha) from which they harvested 33 445 tonnes of seed.

From the 1984 crop, 9513.8 tonnes were exported to the U.S.A. This included 57.5 tonnes Kennebec, 145.5 tonnes Norchip, 40.1 tonnes Shepody, 61.2 tonnes Lemhi Russet, 2029.4 tonnes Norgold Russet, and 7180.1 tonnes Russet Burbank seed. By late December, 40 tonnes of Yukon Gold seed potatoes had been shipped to the California market from the 1985 crop. In early fall, frost caused some damage to the seed potatoes prior to harvest.

In 1985, seed potato plantings increased by 37 percent, production increased by 45 per cent, and exports to the U.S.A. increased by 53 per cent.

SEED POTATO PROJECT - J. R. Letal, S. Slopek, and W. Davies

Pre-Elite Seed Potato Production and Testing

In the spring of 1985, 27 000 tubers were distributed to 24 seed growers in Alberta, while sixty thousand seed potato tubers of sixteen cultivars were produced for distribution to seed growers for the spring of 1986. An additional six cultivars were produced specifically for the commercial field evaluation trials.

The production of disease-free plants is being changed from rooting cuttings from disease-free mother plants to the use of meristem culture. The meristem, which originate from nuclear plants that have been tested and found free from bacterial ring rot, blackleg, potato virus X, potato virus S, potato spindle tuber viroid, and potato leaf roll virus, are planted in the greenhouse. The resulting tubers are grown for one generation in the field to produce pre-elite seed that is sold to Alberta seed potato producers.

Propagation of Seed Potatoes by Tissue Culturing Techniques

A suitable growing medium had to be found to enable the propagation and production of disease-free seed potatoes, and the following media were developed: Murashigi-Skoog medium (MS medium) supplemented with naphthalene acetic acid (NAA) or indole butyric acid (IBA) and 6-benzylaminopurine (BAP) was most suitable for establishment; MS supplemented with BAP was most suitable for multiplication; and MS medium supplemented with gibberellic acid and NAA or IBA was most suitable for rooting. These media are presently being used for multiplying "disease-free" seed potatoes.

Overwintering Sites for Greenpeach Aphids

This research was undertaken to determine the overwintering sites for greenpeach aphids, of which the primary hosts, potato storages and greenhouse bedding plants, were examined.

There was no indication of winter survival of greenpeach aphids on potential primary hosts such as Canada plum, chokecherry, and pincherry, and no overwintering in commercial potato storages. However, overwintering and multiplication occurred on bedding plants in greenhouses and on potato sprouts in two separate home vegetable storages. Greenpeach aphids from greenhouses move outdoors with the bedding plants. These aphids moved to weed species and were observed to be multiplying on shepherd's purse, lamb's-quarters, henbit, red-rooted pigweed, rapeseed, groundsel, wild mustard, blue burr, stinkweed, and night flowering catchfly.

Greenhouses and home vegetable storages are important overwintering sites for greenpeach aphids.

Insecticide Control of Greenpeach Aphids - S. Slopek and J. Letal

Greenpeach and potato aphids were controlled equally well in fields treated by growers with aldicarb and phorate as a pre-plant treatment. Both chemicals controlled aphids until mid-August.

Foliar sprays of various insecticides gave inconsistent results. Therefore, a greenhouse trial to investigate the effects of foliar applied insecticides on greenpeach aphid populations was undertaken. In these trials, pirimicarb, fenvalerate, methamidophos, and acephate gave 100 per cent control of the greenpeach aphids, while malathion and dimethoate gave poor control.

In conclusion, pirimicarb, fenvalerate, and methamidosphos can be used as an alternative or in combination with the soil-applied insecticides for control of greenpeach and potato aphids. Presently, acephate is not registered for use on potatoes.

Relationship Between Greenpeach Aphids and Potato Leaf Roll Virus

Seed potato fields were monitored for aphids by randomly picking compound leaves and counting and recording the potato and greenpeach aphids separately (see Table 10 for field counts). Plants showing symptoms of potato leaf roll virus were also recorded. Later observations on current season leaf roll levels were made. In 1985, except for the Sangre field, aphid populations of both species were much lower than in 1984. Fields treated with aldicarb or phorate had no aphids until mid-August, and then only in low numbers. In an aldicarb-treated field, leaf roll spread to only one or two adjacent plants, whereas in non-treated fields there were ten or twelve adjacent infested plants. Greenpeach aphids nymphs are primarily responsible for this plant-to-plant spread of potato leaf roll virus. With

aldicarb-treated plants, the aphids were killed before being able to spread the virus.

Tolerance levels for greenpeach aphids in seed potato fields have been established after 2 years of observations. If a field is isolated and free from potato leaf roll, the tolerance level is 15 greenpeach aphids per 100 leaves. If the field is close to a source of potato leaf roll, or if a trace level of potato leaf roll is present in the field, then the tolerance is ten greenpeach aphids. If the field has moderate potato leaf roll and is close to other sources of this virus, then the tolerance is two greenpeach aphids per one hundred leaves. The tolerance for potato aphids is 30 times that for greenpeach aphids.

Table 10. Summary of aphid sampling, 1985

Treatment	Cultivar[z]	Field	Date	(# aphids/ 100 leaves) GPA	PA
SPRUCE GROVE AREA					
Temik 9 kg/ac. (22.5 kg/ha)	RB	1	July 15	0	0
		1	July 24	0	3
		1	Aug. 16	0	3
Temik 9.1 kg/ac. (22.5 kg/ha)	RB	2	July 15	0	0
		2	July 24	0	0
		2	Aug. 16	0	0
---	RB	3	July 24	0	0
OLIVER AREA					
Furadan 85 g/ac (210 g/ha)	Sangre	1	July 15	0	120
		1	July 25	0	144
		1	Aug. 15	0	1087
Furadan 85 g/ac (210 g/ha)	RB	2	July 15	0	8
		2	July 25	1	3
		2	Aug. 15	0	56
Temik 3.6 kg/ac. (8.9 kg/ha)	NR	3	July 16	0	0
		3	July 25	0	0
		3	Aug. 15	11	3
Thimet 890 g/ac (2.2 kg/ha)	NR	4	July 16	0	0
		4	July 25	0	0
		4	Aug. 15	0	17
GIBBONS AREA					
–	RB	1	Aug. 23	0	19
LACOMBE AREA					
-	RB	1	July 19	0	21
		1	Aug. 27	0	2
-	RB	2	July 19	1	43
		2	Aug. 27	0	9
-	RB	3	July 19	0	6
		3	Aug. 27	0	6
SOUTHERN ALBERTA					
-	RB	1	Aug. 20	3	47
-	RB	2	Aug. 20	0	40
-	RB	3	Aug. 20	2	81

[z]Cultivars RB - Russet Burbank, NR - Norgold Russet.

SPECIAL CROPS PROGRAM

COMMODITY REVIEW - R. Gaudiel

The area seeded to sunflowers, safflowers, and most pulse crops increased slightly in 1985 compared with last year's acreage. The increase was due mainly to the favorable market outlook and prices of these crops early in the year.

Table 11. Approximate acreages and yields of some special crops in Alberta, 1985.

Crop	Area in Acres (hectares)	Yield in lb/acre (kg/ha)
Drybean	7700 (3100)	1900 (2100)
Drypea	19000 (7700)	2350 (2600)
Lentil	3000 (1200)	850 (960)
Fababean	5000 (2000)	2100 (2400)
Buckwheat	100 (40)	- (-)
Canary Seed	500 (284)	650 (730)
Mustard	55000 (22000)	546 (600)
Sunflower	3000 (1200)	2250 (2500)
Grain Corn	12000 (4900)	4200 (4700)

Drybean acreage in 1985 increased by approximately 45 percent over last year's levels. Production consisted primarily of small red, pink, great northern, and pinto bean types with a small amount of small white. Area of production continued to be around Bow Island and Grassy Lake with some fields located as far west as Barnwell and as far north as Rolling Hills. Generally, yield of the 1985 crop was good, but quality was lower than last year because of the cool and wet August that delayed crop maturity.

Lentil acreage increased by approximately 50 percent. Most of the production was on dryland. Yield was higher than last year in spite of the dry weather conditions during summer. High prices paid for the 1985 crop will likely encourage more production in 1986.

Sunflower acreage in 1985 increased by approximately 30 percent over last year's level. Although confectionery sunflowers were the principal type grown in the Bow Island-Burdett area, some oilseed types were produced for the bird seed market. Most of the confectionery type was grown under irrigation, while most of the oilseed type was produced on dryland. Yield and quality of the 1985 crop were relatively high on both irrigated and dryland crops.

Grain corn acreage decreased in 1985 because some of the crops planted for grain were harvested as silage. Grain quality was very poor because of the cool and wet August and September that delayed

and prevented proper maturity of the grain. Acreage of corn grown for silage increased slightly.

DRYBEAN CULTIVAR AND CULTURAL PROJECT - R. Gaudiel and C. Wildschut

Drybean Cultivar Trials

Five types of trials were conducted at Brooks, Bow Island, and Barnwell to evaluate drybean cultivars, selections, and breeding lines for yield, maturity, and other agronomic characteristics. Some cultivars and selections were also planted in farmers' fields for demonstration and commercial field evaluation. Most of the trials at Brooks were not harvested because of inclement weather at harvest time.

Advance Yield Tests - Cultivars and lines found promising in other tests were further evaluated at Brooks and Bow Island. 'Archetypes' (tall, erect, narrow-profile plants) were late maturing. The new small white cultivar, Northland, was again as early, but slightly lower yielding, than the standard cultivar, Seafarer. Fiesta and D81123 are pinto types that continue to produce satisfactory yields and are early to mature. The small red, D79144, was the earliest to mature and produced satisfactory yield. The new pinks, Victor and Harold, were similar in maturity and yield to the standard Viva, but had larger seeds. The highest yielding light red kidney was Red Kloud.

U. S. Cooperative Nursery Tests - Forty-four new cultivars and lines developed by American breeders were tested at Brooks and Bow Island. Again, all the 'archetypes' were late to mature. There were two small white lines that were as early and yielded as well as the standard, Seaforth. The small red line, GH-760, was earlier to mature and similar in yield to the standard cultivar, UI 36. All dark red kidneys were late maturing.

Observational Tests - Approximately 180 cultivars and lines covering 11 bean types were evaluated at Brooks, and 45 selected cultivars and lines were evaluated at Bow Island. Another 30 breeding lines of small whites received from the Agriculture Canada breeding program at Harrow, Ontario, were also tested at Bow Island. Data from the 'Harrow' and the Brooks tests were not taken because of poor emergence and inclement harvest weather, respectively. A few great northerns, pintos, and small whites appeared promising in maturity and yield.

Adaptability Tests - Selected cultivars and lines were planted at Barnwell in unreplicated four-row plots to evaluate the adaptability of drybeans in a lower heat unit irrigated area of Alberta. Most of the cultivars and lines previously identified as promising in other trials were found to be early and satisfactory yielders. Some new pintos, small whites, small reds, and pinks were also compared with the current

commercial cultivars in farmers' fields at Bow Island. Some small whites, small reds, and pintos were earlier maturing than the standard cultivars.

Screening Tests - Selections of breeding lines of 'archetype' beans originally obtained from Michigan State University (MSU), and new selections selected from the International Bean Yield and Adaptation Nursery (IBYAN) program of Centro Internacional de Agricultura Tropical (CIAT) in Columbia, were again screened for adaptability at Brooks. No reliable data was obtained because of poor harvesting conditions.

Drybean Cultural Trials

Micronutrient Fertilization - Different kinds of micronutrient elements were applied to the cultivar GN 1140 at Bow Island to determine the yield response of drybeans. The zinc treatments were both soil- and foliar-applied at various rates and with different carriers. The copper, manganese, iron, and complete treatments were only applied foliarly. Crop response was variable. No significant differences in yield, harvest index, seed size, and test weight were observed among plants subjected to the different treatments.

Nitrogen and Phosphorous Trials - Different rates of nitrogen and phosphorus were again applied to drybeans at four test sites in Bow Island, Barnwell, and Lethbridge, to determine the best fertilization rate. In addition, certain treatments were included to determine the effects of sulphur, potassium, and selected micronutrient fertilization. Also, an additional test was again conducted at Bow Island to determine the interaction of inoculating plants with N-fixing bacteria and different rates of nitrogen fertilizers. Only at Bow Island was there a slight yield increase of drybeans to application of nitrogen and phosphorus up to 24 kg/ac (60 kg/ha) and 8 kg/ac (20 kg/ha), respectively. At Bow Island, yield appeared to be reduced when zinc and sulfur were not applied. The effects of inoculation and application of different rates of nitrogen were again variable and there were no apparent yield differences among treatments.

Cultivar Responses to Zinc Application - Twelve drybean cultivars were sprayed three times with a zinc solution, and their yield compared with duplicate plots of unsprayed plants. No reliable information was obtained due to soil variability and water puddling.

Chemical Sprays for Pod Set and Development - Nine different chemicals were foliar-applied to three drybean cultivars at Brooks and Bow Island to determine if pod set and yield could be increased. Preliminary observation indicated that pod set and yield were not affected by any of the treatments.

NEW CROPS CULTURAL, CULTIVAR AND ADAPTABILITY PROJECT - R. Gaudiel and C. Wildschut

Fababean Cultivar and Cultural Trials

Twelve cultivars and advanced lines included in the Fababean Co-operative test were evaluated for yield and maturity at Brooks and Bow Island. Ten other selections received from the Agriculture Canada Research Station, Lacombe, were again evaluated at Brooks. The Lacombe lines, although lower yielding and shorter in height, were the earliest to mature. These lines may have potential for production in the central and northern areas of Alberta. There were no significant differences in yield among cultivars at Brooks, but at Bow Island, the new cultivar, Encore, was the top yielder.

At Bow Island, spraying nine different chemicals used in in-vitro pollen culture, to fababeans during early bloom did not appear to affect the number of pods set and the yield of the plants.

Soybean Cultivar Trials

Twenty cultivars and lines included in the Regional Co-operative Test were evaluated for yield, maturity, and plant characteristics at Brooks and Bow Island. Also, ten lines received from the King Grain Company at Chatham, Ontario were evaluated at both locations. Because of inclement weather the Brooks test was not harvested. At Bow Island, the new cultivars, Maple Ridge and KG20, were both early and high yielders. Among the 'natto' types, Canatto was earlier and yielded higher than Nattawa.

Lentil Cultivar and Cultural Trials

Six cultivars were evaluated for yield and maturity at Brooks (irrigated) and Acadia Valley (dryland). The plot at Acadia Valley was damaged by grasshoppers. In Brooks, under irrigation, Eston was the highest yielder and Laird the lowest yielder. On dryland the reverse usually happened, i.e. Laird outyielded Eston.

Field Pea Cultivar and Cultural Trials

Twenty cultivars and lines, from the Fieldpea Co-operative Test, were tested at Brooks. A few lines showed potential for high yields. The new semi-leafless cultivar, Tipu, was slightly lower yielding but earlier maturing.

Eighteen cultivars and lines obtained from Sweden, Finland, and the United States were evaluated for plant characteristic, yield, and maturity at Brooks. Several of the semi-leafless Swedish lines were upright in growth habit, had green-colored seed coat, and yielded well. Several cultivars and lines were earlier and yielded as well as the standard cultivars.

Ten green-seeded cultivars and lines were harvested at different stages of maturity to determine effects on the color quality of the seed. There is a preference for unbleached, uniform, green-colored peas. The cool and wet weather during August and September prevented complete harvesting and threshing of the samples. No reliable data was obtained.

Different amounts of nitrogen and phosphorus were again applied to field pea plots at Bow Island and Lethbridge to determine the yield response to varying rates of fertilization. Additional treatments were included to evaluate the effects of potassium, sulphur, boron, and zinc on field pea yields. There was no significant yield response to the different fertilizer treatments. This could probably be due to the adequate levels of residual nitrogen and phosphorus found in the soil.

Other Pulse Crop Cultivar and Adaptability Trials

Eight Lathyrus spp. selections were tested at Brooks. Two lines, NC8A-64C and NC8A-67, appeared to be earlier and higher yielding than the rest.

The three adzuki beans planted at Bow Island and the peanut selections planted at Brooks did not mature.

Several legume crops were harvested at weekly intervals to determine their growth pattern under irrigated and dryland conditions. Fieldpea was the fastest to grow early in the season while the biennial legume, sweet clover, made most of its growth later in the season. Legume crops, with fast rate of dry matter production, is promising for green manure.

Mustard Cultivar Trials

Fifteen mustard cultivars and lines were evaluated at Brooks for maturity and yield. All of the entries matured before the killing frost. Poor and variable emergence resulted from the dry spring. Significant differences among entries could have been masked by the high variability. The oriental mustards were generally higher yielding than the yellow types.

Sunflower Cultivar and Cultural Trials

Sunflower Cultivar Trials - Three confectionery hybrid tests were conducted at Brooks, Bow Island, and Burdett to evaluate the performance of sunflower hybrids for yield, seed size, and maturity. Birds damaged the tests at Brooks and Burdett. In Bow Island, no significant differences were found among the 22 hybrids tested. Head rot was observed probably due to the cool and wet August.

The oilseed hybrid test at Brooks was not harvested because of severe bird damage.

Sunflower Cultural Trials - Three tests were conducted under irrigation at Brooks, Bow Island, and Burdett to determine the effects of plant population on the yield and seed size of confectionery sunflower. The tests at Brooks and Burdett were discarded because of bird damage. At Bow Island, the proportion of large seed was reduced drastically as the plant population increased from 6,000 to 36,000 plants/acre (15,000 to 90,000 plants/ha). This reduction was more pronounced in the smaller seeded Sheyenne 043 than in the larger seeded Sigco 954. Populations between 18,000 to 24,000 plants/acre (45,000 to 60,000 plants/ha) gave satisfactory yields without drastic reduction in the proportion of large seeds produced.

Varying rates of nitrogen and phosphorus were applied to Sigco 954 sunflower under irrigation in two test sites at Bow Island. There was no obvious yield response to the different rates of nitrogen and phosphorus applied. Relatively high levels of these nutrient elements below the 30-cm depth must have been adequate for plant requirements.

A preliminary test at Bow Island to study the effects of seeding dates on two sunflower hybrids showed higher yields for early seeded sunflower. Plants seeded during the last week of May failed to mature.

Safflower Cultivar Trials

Three tests were conducted on dryland at Brooks, Bow Island, and Acadia Valley to evaluate new selections of safflower for yield and maturity. The Brooks and Acadia Valley tests were discarded because of gopher and grasshopper damage, respectively. In Bow Island, the new cultivar, Saffire, was the earliest to mature, had the highest yields, and had the lowest incidence of sclerotinia head rot.

HERB AND SPICE ADAPTABILITY AND CULTURAL PROJECT - R. Gaudiel

Spice and Essential Oil Demonstration and Observational Trial

Approximately 30 annual and perennial spice and essential oil crops were again maintained or established in 1985. Growth of the perennials was slow and some of the less hardy ones did not survive the winter. Most of the annuals grew very well, especially summer savory, basil, dill, and parsley.

Eight fenugreek cultivars and lines were evaluated at Brooks for yield and maturity. None of the cultivars or lines matured before the first killing frost.

CORN AND SORGHUM CULTIVAR AND CULTURAL PROJECT - R. Gaudiel and A. Middleton

Fieldcorn Hybrid Trials

Four tests were again conducted at Brooks and Bow Island to evaluate new corn hybrids for grain and silage for licensing and recommendation purposes.

These sites are part of a four-site testing program in southern Alberta that is sponsored by the Alberta Corn Committee. The wet April delayed seeding and the subsequent dry May resulted in uneven emergence. Cool temperatures during August and September reduced the amount of corn heat units accumulated during the season. Grain yield at Brooks averaged 4,827 lb/ac (5,424 kg/ha) with a range of 3,453 lb/ac (3,830 kg/ha) to 6,243 lb/ac (7,015 kg/ha). At Bow Island, the lowest and highest grain yields were 2,709 lb/ac (3,044 kg/ha) and 6,034 lb/ac (6,780 kg/ha), respectively, with an average of 4,506 lb/ac (5,063 kg/ha). Grain quality was generally poor this year.

Silage yield at Brooks averaged 5.3 t/ac (11.8 t/ha) with the lowest and highest yields of 4.2 t/ac (9.5 t/ha) and 6.9 t/ac (15.3 t/ha), respectively. At Bow Island, the average was 5.7 t/ac (12.8 t/ha) with the lowest and highest yields of 4.1 t/ac (9.2 t/ha) and 7.8 t/ac (17.5 t/ha), respectively.

Fieldcorn Cultural Trials

Varying rates of nitrogen and phosphorus were applied to grain and silage corn at each of four test sites at Bow Island and Burdett to help establish the relationship between fertilization rates and soil test values so that proper fertilization recommendations can be made. Additional treatments involving potassium, sulfur, zinc, and boron were also included to determine their effects on corn yield. Preliminary analyses of the data did not show any dramatic response of grain and silage corn to the various fertilization treatments. Perhaps, the residual levels of these nutrients found at the lower soil horizons were sufficient for optimum growth and production.

Forage and Grain Sorghum Cultivar Trials

Five cultivars and lines of grain sorghum were evaluated on dryland conditions at Brooks for grain yield and maturity. No line or cultivar was better than the standard cultivar P145 in yield and maturity.

Six cultivars and lines of forage-type sorghum were evaluated for silage on dryland conditions at Brooks. Su-Ghum 60 gave the highest yield.

Five cultivars of sudan grasses were evaluated for simulated pasture on dryland conditions at Brooks. The cultivars, Trudan 8 and ST6, produced the highest amount of dry matter.

CEREALS AND OILSEED CULTIVAR PROJECT - R. Gaudiel and A. Middleton

New and standard cultivars of barley, hard red spring wheat, durum wheat, utility wheat, triticale, oats, flax, and canola were evaluated at Acadia Valley, Standard, Brooks, and Bow Island. This project is in co-operation with the Field Crops Branch, Alberta Agriculture, and is part of a 34-site province-wide testing program.

In each location, 30 barley, 11 hard red spring wheat, 9 durum, 12 utility wheat and triticale, 11 oat, 5 flax, and 7 canola cultivars were evaluated for yield, maturity, and other agronomic characteristics. Acadia Valley was the only site that was not irrigated. In addition, 18 new lines of triticale, included in the National Co-operative Test, were tested at Brooks and Bow Island. Also, 20 advanced triticale lines, 60 advanced barley lines, 4 semi-dwarf barley lines, and 20 winter wheat and triticale lines from the breeding program of the Field Crops Branch at Lacombe were evaluated at Brooks.

The tests at Standard were lost because of shattering, bird damage, and mechanical damage. The canola, flax, and oat tests at Acadia Valley were discarded because of grasshopper damage. Data from the 34 sites were analyzed and collated, and are published in the 1985 Annual Report of the Cereal and Oilseed Advisory Committee Regional Variety Testing Program. The compiled data were used to make and revise the 1986 varietal recommendations of Cereals and Oilseeds for Alberta.

FORAGE CROP GROWTH PATTERN AT DIFFERENT IRRIGATION REGIMES - R. Gaudiel, M. Braithwaite, and I. Selirio[2]

Plots of alfalfa, brome grass, crested wheatgrass, and an alfalfa-brome grass mix were established in 1983 and 1984 at Brooks to quantify the effect of soil moisture on the growth and development of forage crops. This information will be used to improve the forage crop insurance program of Alberta. This project is funded by and is in co-operation with the Alberta Hail and Crop Insurance Corporation.

In 1985, three water regimes were maintained on each forage crop through controlled irrigation, and the plots were harvested weekly to measure the growth pattern of the crops. Preliminary analysis showed the forage crops to have a similar growth response to the different irrigation treatments. Differences in growth pattern were

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more apparent between those plants grown without irrigation and those grown on plots with soil moisture maintained at 35 percent of available moisture. Differences on growth pattern were not as large between crops subjected to soil moistures maintained at 35 percent and 75 percent of available moisture.

ANNUAL FORAGE PROJECT - G. Riemer, K. Fujimoto and R. Gaudiel

This project is funded by the Farming for the Future (FFF) program. At the start of the second mandate of the FFF program in 1984, the emphasis was towards studies of annual forages for pasture rather than for silage or hay production. This emphasis was continued in 1985 which was the last year for this project. Detailed results of the 1985 trials are reported in AHRC Pamphlet 86-6 - Progress Report on Trials Involving Annual Forages, 1985, which is available upon request.

Annual Forage Cultivar Trials

Cultivar tests of three crop species were conducted in 1985 at various locations in southern Alberta.

Advanced lines and new cultivars of barley were evaluated in Brooks in conjunction with Alberta Agriculture, Field Crops Branch, Lacombe, to determine dry matter yield for hay and/or silage. As in previous years, no significant yield differences occurred among cultivars. Two lines; H7414002, 6,450 kg/ac (15,930 kg/ha) and BT522, 5,920 kg/ac (14,630 kg/ha) had yields as high as Johnston, 5,960 kg/ac (14,730 kg/ha).

Advanced lines of triticale that were selected for forage yield were evaluated at Brooks in conjunction with Agriculture Canada Research Station, Swift Current. No significant yield differences occurred between cultivars. Among the high yielding cultivars and lines were: CA82-49, 6,030 kg/ac (14,890 kg/ha); HY320, a wheat check, 5,950 kg/ac (14,700 kg/ha); CA82-34, 5,940 kg/ac (4,660 kg/ha) and CA82-36, 6,070 kg/ac (15,000 kg/ha).

Co-operative cultivar tests of European forage brassicas were initiated in 1984 to ascertain late fall pasture yield, quality, and agronomic suitability of forage brassicas in various agroclimatic regions of Alberta. Six tests in co-operation with staff from Agriculture Canada (Lethbridge, Lacombe, Beaverlodge), Alberta Environmental Centre, Vegreville, and Agriculture Canada, Prince George, B.C., as well as AHRC, Brooks, were conducted to cover varying soil and climatic conditions. Data received have shown the forage brassicas to be highly susceptible to drought as exemplified by the poor yields at Beaverlodge, 0.58 to 2.3 t/ac (1.43 to 5.69 t/ha) where it was very dry. Yields were moderate at Lacombe, 1.77 to 4.11 t/ac (4.37 to 10.16 t/ha) and good at the irrigated sites at Brooks and Lethbridge with maximum yields of 10.52 t/ac (25.98 t/ha) and 4.26 t/ac (10.53 t/ha), respectively. These data are similar to those of 1984.

Among the high yielding cultivars at all sites were Condor kale, Barsica kale, Maris Kestrel kale, Crail and Neris fodder radish, Petronova fodder rapeseed, Emerald forage rape, and Gorta forage rape.

Available lines of winter barley and winter triticale from eastern Canada, Idaho, and Field Crops Branch, Lacombe, were screened for summer and fall pasture yields and resistance to barley yellows. Dry matter pasture yield was taken by clipping one-half the plot several times during the season while the other one-half was harvested for hay yield. As in previous years, the yields of some of the winter barleys were higher than the winter wheat check and the winter triticales. The plots were inspected for disease infestations. All winter barleys were heavily infested with barley yellows, the winter wheat showed some signs of leaf rust while the winter triticale, Wintri, and Musketeer fall rye were disease free.

In 1985, an annual forage adaptability trial, in co-operation with Dr. B. Berkenkamp, Agriculture Canada Research Station, Lacombe, was conducted at Brooks as part of an eight-site western Canada annual forage co-operative test. The new line of oats, 0A330-60, was again the highest yielding oat 3,750 kg/ac (9,270 kg/ha) by a significant margin. The highest yielding cultivars were Merlin kale 6,320 kg/ac (15,610 kg/ha) and Pioneer 3995 corn 5,650 kg/ac (13,960 kg/ha) followed by Pitic 62 wheat 4,810 kg/ac (11,210 kg/ha), Triwell triticale 4,790 kg/ac (11,820 kg/ha) and Johnston barley 4,540 kg/ac (11,210 kg/ha).

Annual Forage Cultural Trials

Forage Brassica Trials - Trials were conducted on forage rapes and forage kales to ascertain proper seeding rates, seeding dates, and harvest dates. Dry matter yields and dry matter percentages of one cut pasture yield, plant stand, plant height, protein content, acid detergent fiber, and nitrate levels were obtained. Forage kale responded similarly to forage rape. In both crops, yield declined proportionally to the delay in seeding. The dry matter accumulation rate of forage kale, as determined in a harvest dates trial, is linear from late July through to October. No significant differences in yield were found as seeding rates increased from 1.0 kg/ac to 4.0 kg/ac (2.5 kg/ha to 10.0 kg/ha). This indicates that very low seeding rates can be used without adversely affecting yield.

Winter Cereals Seeding Dates Trial - The objectives of this trial, which was seeded in 1984, were to find the seeding date and clipping height that optimize dry matter yield over a 2-year period. The effect of seeding date and clipping height on dry matter pasture yield, overwintering ability, and spring yield of fall rye and winter wheat were examined. Winter survival, as indicated by plant stand, was measured in the spring of 1985 along with spring yields. Data from the past 3 years indicates that when seeded prior to August and lightly grazed, winter wheat performs no better as a pasture than fall rye. However, fall rye provided more hay the following year. When

grazed heavily, May-seeded winter wheat produced the most pasture. Late summer seeding of both crops the previous year gave the highest hay yields the following year. Fall rye suffers less winter kill than winter wheat in all the seeding dates.

Pasture Management Trial - This trial, which was started in 1981, was designed to compare the pasture dry matter production of annuals with perennials. Annual pastures are not as productive as perennial pastures when compared for more than 3 years. However, annuals were more productive if comparison was made during the first 2 years. Protein levels of annual pastures were higher than the perennial pastures. A steady decline in annual pasture yields was noted in 1984. Much of the yield reduction was attributed to increased build up of leaf rust in the continuously cropped annual pasture plots. In 1985, the plot site for the annuals was changed to previously-fallowed land. As in the first few years of the trial, all the annual summer pasture cultivars had higher total yields than the perennial pasture cultivars. These plots, in addition to the fall seeded plots, were retained for yield evaluation in the spring of 1986.

Winter Cereal Spring Grazing Trial - Fall-seeded fall rye has long been used for spring pasture; however, the effect of spring grazing on subsequent hay or grain yields has never been documented in Alberta. This experiment was begun to ascertain the stage of plant development of winter wheat, fall rye, and winter triticale after which grazing should be discontinued. Pasture dry matter yield and regrowth for hay and grain was determined from early May to the shot blade stage. Grain and hay yields on undisturbed plots served as the check. Winter wheat, fall rye, and winter triticale were seeded in early September, 1984 for 1985 harvest. The severe winter of 1984-85 resulted in a complete kill of the winter triticale and non-uniform winterkill in the Norstar winter wheat. As a result, only 'Musketeer' fall rye was evaluated in the spring. Delaying the weekly clipping of fall rye from May 8 to June 13 increased the pasture yield. The hay yield of the resultant regrowth of these plots was significantly lower than the uncut check only after the May 16 clipping. When the pasture and hay yields were combined, no significant total yield differences could be found between clipping dates.

The grain yield of these plots was also taken as many stockman will harvest spring grazed fall rye. As with regrowth for hay, no significant grain yield difference occurred between the check and the May 8 and May 16 clippings. By May 16, the fall rye had formed six tillers and the first joint on the earliest tiller was 5 cm above the crown. By May 24, the first tiller was forming the boot and preparing to emerge. These findings confirm earlier work at Brooks in 1982. Grain samples were sent to the Canadian Grain Commission for grading. The effect of clipping dates on grade was similar to that of yield, i.e. after May 16, grain grades were lower. Clipping dates have a significant effect on the amount of ergot found in the grain. Those plants clipped in June had significantly more ergot and graded lower than those clipped in May. We do not know whether the delay in flowering due to the clipping caused this effect.

In the fall of 1985, seeding was done for trials to be harvested in the spring of 1986.

Species Evaluation for Pasture - The objective of this trial is to evaluate the potential of new crop species and cultivars for pasture yield and quality. In the past, this trial evaluated only spring seeded crops subjected to multiple cuts to simulate grazing. Beginning in 1984, it also included fall-seeded and one-cut pasture (e.g. late fall pasturing of corn and brassicas) crops. This would have enabled better comparisons of year round management of grazing systems, except for the severe winter of 1984-85. This resulted in winterkill of most of the plots from the 1984 trial, and no valuable spring pasture data was collected.

This trial was repeated in 1985 with a few additional cultivars. The total yields were similar to those of previous years. The forage rape and kale 3,880 kg/ac (9,590 kg/ha) and 3,780 kg/ac (9,330 kg/ha), respectively, which were cut only in late fall, were among the highest yielding cultivars. A line of winter wheat, KAe6D, which was bred at Agriculture Canada, Lethbridge, for resistance to the mite that is the vector of wheat streak mosaic virus, was the second highest yielding cultivar 3,840 kg/ac (9,480 kg/ha). The soils at this site are considered to be the cause of the poor growth of corn 3,120 kg/ac (7,700 kg/ha) and sudan grass 1,150 kg/ac (2,830 kg/ha). Among the other low yielding cultivars were Appin stubble turnip 2,310 kg/ac (5,700 kg/ha), Foothills oats 2,440 kg/ac (6,020 kg/ha) and Wintri winter triticale 2,610 kg/ac (6,450 kg/ha).

This trial, in addition to fall seeded plots, remained in the field for yield evaluation in 1986.

Seed Production of Forage Brassicas - The objective of this trial is to determine whether winter annual forage rapes and kales will overwinter and produce economic yields of seed in Alberta. Four cultivars seeded on September 17 and October 4, 1984, did not survive the winter and no data were collected. In the fall of 1985, this trial was repeated but seeded on later dates, September 26 and October 31. The soil had undergone some freeze-thaw cycles by the last date and 'freeze up' followed soon after. These plots will be evaluated in the spring of 1986.

Hay and Pasture Mixtures - The objective of this trial is to find the best yielding spring-seeded cereal mixture for one-cut hay or silage and subsequent annual pasture (winter wheat, fall rye, and Italian ryegrass) for late summer and fall grazing. Both hay and pasture dry matter yields were obtained. The 1985 results correspond closely with those from 1983 and 1984. The regrowth of underseeded fall rye 1,010 kg/ac (2,500 kg/ha) and Italian ryegrass 690 kg/ac to 1,720 kg/ac (1,700 kg/ha to 4,240 kg/ha) was very good. However, the regrowth of winter wheat underseeded to barley was very low, 80 kg/ac (140 kg/ha). Seeding error is suspected for this unusually low yield. Except for the underseeded winter wheat plots, the underseeded oats

plots had twice as much regrowth as oats grown alone. Underseeded barley had regrowth comparable to oats alone while barley grown alone had almost no regrowth.

Barley mixtures were not as productive, probably due to the more competitive nature of the barley plant. These pastured plots will be left to overwinter for evaluation of hay and grain yields in 1986.

The plots that were overwintered from the trial conducted in 1984 gave some interesting data in spite of the fact that the winter wheat suffered some winter kill. The fall rye underseeded to both oats 2,310 kg/ac (1,210 kg/ha) and barley 2,620 kg/ac (2,460 kg/ha) produced good hay yields on July 23, 1985. The winter wheat underseeded to oats 490 kg/ac (1,210 kg/ha) and barley 1,000 kg/ac (2,460 kg/ha) was significantly lower yielding because stands were greatly reduced by winterkill.

The total yields (1984 pasture + 1985 hay yields) of the fall rye underseeded plots were significantly higher than all other treatments.

Catch Cropping (Second Cropping) for Annual Pasture - The purpose is to determine whether certain annual crops can be top-seeded with another crop mid-way in the season so that forage from the later seeded crop may be available in the fall after the first crop has been harvested. Two trials were conducted in 1984 on barley and on corn, with poor success due to treatments being applied too late. In 1985, two trials were again conducted, one on barley and one on corn. In the barley trial, seeding of six catch crops was done prior to and after the silage harvest of the barley on July 16 and August 6, respectively. Only one seeding date on July 16 was made in standing corn.

The catch crops in corn did not establish except for a few annual ryegrass plants. As silage corn is usually harvested in mid-September, there is very little time left for growth of the catch crop even if establishment occurs. In barley, while no significant yield differences occurred between the pre- and post-silage harvest seeding dates, significant yield difference occurred between underseeded cultivars. The yields of the check barley regrowth 230 kg/ac (580 kg/ha) and Galt barley seeded into the barley silage crop on July 16, 280 kg/ac (700 kg/ha) were significantly lower (by a margin of 2-3 times their own yield) than all other underseeded or post harvest seeded treatments.

Another trial involving cultivation and reseeding barley into barley stubble was deemed of little value due to volunteer barley problems.

Demonstration Trials

Relatively large scale field plots (5-40 acres) were set up in co-operation with other forage and farmer research associations and interested parties throughout Alberta to observe and evaluate the performance of some annual forage crops under farm conditions.

These field-size plots included several spring-seeded forage brassicas for fall pasture; top-seeded forage brassicas in standing cereal crops for fall pasture; winter wheat; and Italian ryegrass either underseeded to cereal crops or alone for summer and fall pastures. Generally, the brassicas yielded poorly in areas where drought occurred. The winter wheat and Italian ryegrass were promising as annual pastures. Many of these trials were featured in farming magazines.

PLANT PATHOLOGY PROGRAM

BROOKS

Articles that provide more detailed information on plant pathology research trials are listed following individual reports or in the Publications and Presentations section at the end of this booklet.

DISEASES OF CEREAL CROPS - R. Howard, F. Harper,[1] B. Puchalski,[2] and E. Moskaluk

Winter Cereal Seed Treatment Trials

Bunt (Tilletia foetida and T. caries) of winter wheat and stem smut (Urocystis occulta) of fall rye are important diseases in Alberta for which seed treatment is a major means of control. In recent years, AHRC staff have been involved in screening fungicides for efficacy against bunt and smut. In 1985, co-operative trials were conducted under the leadership of personnel from the Agriculture Canada Research Station, Lethbridge. Duplicate trials were planted in dryland plots at Brooks and Lethbridge. Individual lots of 'Winalta' winter wheat and 'Cougar' fall rye were treated with seven and six fungicides, respectively, to evaluate their efficacy against bunt and stem smut. The products tested on wheat included XE-779 25% WP, Baytan (triadimenol) 75 g/L SN, BAS-389F (furmecyclox) 50% SN, EL-228 (nuarimol) 10% DU, UBI-2100 (carbathiin) 23% SN, CGA-64251 (etaconazole) 1.25% SN, and RH-3866 13.5% SN. All but EL-228 were also tested on rye. The trials were planted on October 2, 1984.

Unfortunately, winter injury severely reduced the stands of both crops, and those plants which survived had very little disease. Consequently, the trials were abandoned. A new set of trials was planted on September 26, 1985, in which most of the products listed above were included.

DISEASES OF PULSE CROPS - R. Howard and E. Moskaluk

An Evaluation of Fungicides for the Control of White Mold on Dry Peas

White mold (Sclerotinia sclerotiorum) is occasionally a serious disease of field peas in Alberta. No fungicides are presently registered in Canada for control of white mold on peas. In 1985, six fungicides [C0-6054 (metomeclan) 500 g/L SU, Benlate (benomyl) 50% WP, Easout (thiophanate-methyl) 70% WP, Ronilan (vinclozolin) 50% WP, Rovral (iprodione) 50% WP and DPX 965-75 (carbendazim) 75% WP] were

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evaluated for efficacy against white mold in a trial with 'Century' peas at AHRC. The test fungicides were applied with a hand-held boom sprayer when the first-formed pods were about 2.5 cm (1 inch) long. A single application was made using the highest rate recommended by the individual manufacturers. An untreated check was left for comparison.

By mid-August, there was a uniformly heavy incidence of white mold in the plots, but no visible differences in disease incidence occurred between treatments. At harvest, the C0-6054, Benlate, Ronilan, and DPX 965-75 treatments yielded more than the check; however, the differences were not statistically significant ($P<0.05$). The relatively poor performance of Benlate in this trial was surprising, since it has provided good control of white mold in both experimental plots and commercial fields of dry beans in Alberta.

Detailed results of this trial were reported in the 1985 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

An Evaluation of Seed-Applied Fungicides for the Control of Seed Decay, Damping-Off and Root Rot in Processing Peas

Soil-borne diseases are common and cause serious problems on processing pea crops in southern Alberta. Currently registered seed treatments are only partly effective against such diseases. In an effort to find more effective products, five fungicides were compared for their ability to control seed decay, damping-off, and root rot of 'Early Sweet 11' peas. The experimental site was in a commercial field near Tilley, which was naturally infested with Fusarium spp., Pythium spp. and Rhizoctonia solani. The products tested included two registered fungicides [Agrox DL-Plus (15% diazinon + 25% gamma BHC + 15% captan) DU and B-3 (11% diazinon + 16.6% gamma BHC + 33.5% captan) DU] and three experimental fungicides [Apron 70 SD (35% metalaxyl + 35% captan) DU, Sportak (prochloraz) 200 g/L EC, and SAN-518 (56% mancozeb + 8% SAN-371F) WP]. The fungicides were applied as seed dressings just prior to planting. Stand counts and root rot severity ratings were taken at crop maturity, but no yields were measured because of irregular stands.

Plant stands were significantly improved by treatment with Apron, SAN-518 and B-3. No significant differences in root rot severity were noted between any of the fungicide treatments and an untreated check.

Detailed results of this trial were reported in the 1985 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

Screening Processing Pea Cultivars for Resistance to Fusarium Root Rot

Resistant cultivars offer the most promising means of reducing losses from Fusarium root rot in peas. To evaluate the potential of this method, ten processing pea cultivars were planted in the same infested field used for the seed treatment efficacy trial described above. The plants were dug at crop maturity and the roots were washed and rated for root rot severity as a means of assessing their resistance to root rot.

None proved to be highly resistant and, at best, only moderate resistance was observed. In order of increasing resistance, the cultivars were ranked as follows: Puget, Orcas, Bounty, Signet, Headliner, Dark Skin Perfection, Frigit, Early Sweet 11, Popet, and Dane. These findings were comparable with previous trials which have shown that all of the processing pea cultivars currently being grown in Alberta have low to moderate resistance to Fusarium root rot.

An Evaluation of Subsoiling for Root Rot Management in Processing Peas

As a follow up to the trials reported in the 1984 AHRC Annual Report, approximately 1.5 acres (0.6 ha) in each of five processing pea fields near Vauxhall were subsoiled using a Howard Paraplow in early October, 1985. These fields will be cropped to peas in 1986, and data on plant stand, root rot incidence and severity, and yield will be taken. The 1985-86 trials will supplement 1984 studies where the subsoiling was done in the spring rather than the fall. In addition, approximately 5 acres (2 ha) were subsoiled in two Vauxhall-area soft wheat fields, where observations of crop vigor, root rot occurrence, and yield will be made in 1986.

DISEASES OF GREENHOUSE CROPS - R. Howard, M. Briant, C. Hill, E. Moskaluk, and G. Grant

Efficacy of Imazalil Fungicide Against Cucumber Powdery Mildew

Only two fungicides are presently registered in Canada for control of powdery mildew (Erysiphe cichoracearum) on greenhouse cucumbers. An experimental product, imazalil, was applied to six cultivars of greenhouse cucumbers to determine its efficacy in a trial at AHRC. The cultivars were: 5004, Corona, Sandra, Toska, Maram, and Maja. The imazalil was applied in two ways: 1) spray (Fungazil 20 EC at 15 mL/100 L water), and 2) Fungiflor Smoke Generator at 1 or 2 generators/350 m^3 [5 g a.i. imazalil/generator]. Disease severity ratings were made 6-7 days after treatment, and fruit samples were taken for residue analysis.

The smoke generators failed to control the disease, even at the highest rate (two generators/350 m^3). The EC sprays partially curtailed the disease, but it was not a satisfactory degree of control. All of the cultivars were susceptible to mildew, especially Toska and Maram. Residue assays are pending.

Efficacy and Phytotoxicity of Ten Fungicides Applied to Cucumbers for the Control of Pythium Damping-Off

In an effort to find more effective fungicides for controlling cucumber damping-off, Thiram (thiram) 80% WP, Captan (captan) 50% WP, Lesan (fenaminosulf) 35% WP, Truban (etridiazole) 30% WP, No Damp (oxine benzoate) 2.5% EC, XE-779 25% WP, Subdue (metalaxyl) 240 g/L EC and Subdue 5% G were evaluated as soil applications on 'Earlipik' cucumbers in a trial at AHRC in 1985. Apron 35 SD (metalaxyl) 35% DU and Apron 70 SD (35% metalaxyl + 35% captan) DU were also tested as seed treatments. The cucumbers were seeded into soil artificially inoculated with either Pythium irregulare or P. sylvaticum and the fungicides were applied as drenches or granules. The seed dressings were dusted onto the seed prior to planting. Two inoculum rates and three rates/fungicide were evaluated. Emergence data were recorded and analyzed by analysis of variance and regression.

No significant differences in relative pathogenicity were observed between P. irregulare and P. sylvaticum, so the data for these two treatments were combined for subsequent analyses. At the high inoculum rate, emergence in the No Damp treatment at all three rates was significantly ($P<0.05$) lower compared with the check and other fungicides. The metalaxyl-containing products (Subdue and Apron) consistently provided excellent control of damping-off. Truban and Captan gave good control of damping-off, while the remaining products were fair in their efficacy. Truban was phytotoxic at the highest dosage tested. For most of the other fungicides, there was a significant positive relationship between fungicide dosage and efficacy. At the low inoculum rate, emergence in the check and fungicide treatments was high and not significantly different. There was insufficient disease pressure to critically evaluate efficacy at this low rate.

VERTICILLIUM WILT OF ALFALFA - R. Howard, E. Moskaluk, and M. Briant

Thermal Inactivation of Verticillium albo-atrum in Infected Alfalfa Hay

In the 1983 and 1984 AHRC Annual Reports, it was reported that Verticillium albo-atrum (Vaa), the incitant of Verticillium wilt (VW) of alfalfa, was able to survive the dehydration process at two commercial alfalfa-cubing plants in Alberta. In order to determine the temperature tolerance of Vaa, fresh and air-dried VW-infected alfalfa stems and leaves were subjected to temperatures from 30-85°C in 5°C increments for periods from 1 to 8 hours. Following treatment, the stems and leaves were assayed for viable Vaa. The fungus survived for up to 8 hours at temperatures as high as 70°C. At 85°C, it survived at least 1 hour of exposure. A second round of trials was conducted to determine the thermal inactivation point for Vaa for those temperatures where it survived at least 8 hours. These studies showed that at 45°C, the fungus was able to survive 21 days of continuous

exposure (Table 12). At higher temperatures, the survival period was proportionally shorter.

Table 12. Survival of Verticillium albo-atrum in infected alfalfa hay exposed to eight temperature regimes for varying time periods.

Temperature (°C)	Exposure period (days)	Maximum survival (days)
40	21	21
45	21	21
50	21	13
55	7	6
60	7	3
65	7	3
70	2.5	1½
75	2.5	1

Corrosion Potential of Three Disinfestants

In the 1982 AHRC Annual Report, it was reported that formaldehyde and sodium hypochlorite were effective disinfestants against Vaa. Subsequently, these products were recommended to farmers for use in disinfesting haying machinery. Questions pertaining to the corrosiveness of these materials on bare metal prompted an in vitro trial to assess the ability of formaldehyde, sodium hypochlorite, and quaternary ammonia to rust unprotected steel.

Cold-rolled mild steel coupons (C-1018) [1 cm x 7.5 cm x 1 mm thick] of the type used in oilfield corrosion testing were exposed to four concentrations of each disinfestant for periods from 0-6 h. Thereafter, the coupons were air dried for 24 h and a visual estimate was made of the percent coupon surface rusted. Each coupon was then weighed, the rust scraped off, and re-weighed to calculate corrosion loss.

Sodium hypochlorite caused the greatest amount of rust, followed by formaldehyde, quaternary ammonia, and tap water (check). There was insufficient corrosion to produce a noticeable weight loss in any of the treatments. In conclusion, formaldehyde appears to offer the best potential as a disinfestant because of its efficacy against Vaa and relatively low corrosiveness during a short-term exposure.

DISEASES OF VEGETABLES CROPS - R. Howard and M. Dykstra

Efficacy of Rovral and Benlate for Control of Cottony Soft Rot on Chicory Roots

Chicory is grown on a limited acreage in Alberta. The most serious disease on this crop is cottony soft rot caused by Sclerotinia sclerotiorum. The fungus can attack stored roots as well as the shoots in the forcing beds. Since no fungicides are presently registered in Canada for control of this disease, a storage trial was conducted to determine the efficacy of two fungicides, Benlate (benomyl) 50% WP and Rovral (iprodione) 50% WP. Three rates of each fungicide (0.5, 1.0, and 1.5 g product/L) and an untreated check comprised the treatments. Roots used in the trial consisted of a mixture of the following cultivars: Zoom, Terosa, Tardico, Alvara, Metado, and Mitica. Treated roots were inoculated with S. sclerotiorum and incubated under humid conditions at 9°C. Disease development was evaluated visually and severity was rated using a scale from 0 = healthy to 3 = severe rot.

Control was greatest at the 1.5 g/L rate for both fungicides. The disease developed more slowly on the Rovral-treated roots; however, neither fungicide provided acceptable control. It should be noted that inoculum dosage used in this trial was probably higher than would be encouraged in commercial storage.

Detailed results of this trial were reported in the 1985 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

DISEASE SURVEYS - R. Howard and E. Moskaluk

1. Blackleg of Canola - Twelve fields in Census Divisions 2 and 5 were surveyed for blackleg (Leptosphaeria maculans). A mildly virulent strain of the fungus was detected in four fields in the Strathmore/ Carseland area.

2. Verticillium Wilt of Alfalfa - Sixteen alfalfa fields in Census Divisions 1, 2, and 4 were surveyed for VW. The disease was found in three irrigated hay fields in CD #2.

PLANT PATHOLOGY PROGRAM

OLDS

DISEASE SURVEYS - S. Slopek

Verticillium Wilt Survey of Alfalfa

Eleven alfalfa fields in Census Division 8 were surveyed for verticillium wilt (VW) in 1985. No VW was found in any of the fields. A suspected VW infected plant was infected by a bacterium which was identified by the Alberta Environmental Centre as Corynebacterium flaccumfaciens. There have been no previous reports of this bacterium infecting alfalfa and only one report of it causing wilt in a forage legume (Lornia sp.). Consequently, identification of this bacterium is being rechecked and its pathogenicity will be tested.

Blackleg of canola

Twenty-four fields in Census Division 7 were surveyed. Several fields had blackleg leaf and stem infections; however, the blackleg fungus that was subsequently isolated proved to be the avirulent strain in all cases.

DISEASES OF POTATOES - J. Letal and S. Slopek

Potato Leafroll Virus

Research on potato leafroll virus (PLRV) in 1985 consisted of monitoring vector populations and correlating 1984 Florida tests and 1985 early season PLRV with aphid levels recorded in 1984. Details of the aphid monitoring study are presented in the report on the 'Relationship Between Greenpeach Aphids and Potato Leaf Roll Virus' presented earlier.

DISEASES OF CEREAL CROPS - S. Slopek, L. Piening,[1] and D. Orr,[2]

Common Root Rot and Loose Smut Co-operative Seed Dressing Trial

These trials were conducted under the leadership of Dr. L. Piening. Similar trials were conducted at several locations in the province. The barley variety Galt was inoculated with loose smut and then treated with 21 different fungicidal treatments.

Although several fungicides reduced smut levels and several others reduced common root rot damage, no treatment resulted in a

[1]Research Scientist, Agriculture Canada Research Station, Lacombe.

[2]Plant Pathology Technician, Agriculture Canada Research Station, Lacombe.

significant yield increase. The results were similar at the other sites in the province.

Detailed results of these trials were reported in the 1985 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

Foliar Diseases of Barley

Two studies were conducted to evaluate the yield loss effect of foliar diseases. Both studies focused on the effect on yield of infection at early growth stages. In the first experiment, disease infection was simulated by clipping the leaves with scissors. Treatments consisted of:

a) Control, no clipping,
b) removal of one-half of leaf area, and
c) complete removal of leaves.

Treatments were continued until growth stage (GS) 31 (Zadoks scale).

The trial was planted on land which had been previously summer fallowed. The control plots yielded 1085 kg/ac (2680 kg/ha). The one-half and full cut treatments yielded 24 and 48 per cent more than the control, respectively, with increases in yield being the result of more grains produced per tiller. These results are contrary to the results recorded from laboratory experiments. This phenomenon of plant yield increases following damage has been reported in some instances where insect damage occurs (P. Harris, Agriculture Canada, Regina) and is well known to gardeners who are often advised to inflict damage by pruning or pinching off apical buds. Thus, it would seem that if foliar cereal disease infection is severe only during the early growing period, there could be a resulting increase in yield. However, if infections are light, the results may be the opposite. This appears to have occurred in the second treatment.

The second experiment employed a split-plot design to evaluate the effects of two factors, a fungicide (Tilt 250 EC) and a plant growth regulator (Cerone), on disease development and yield. The trial, planted into barley stubble, yielded very poorly as a result of the dry conditions in 1985. An application of Tilt 250 EC at GS 12 (Zadoks scale) resulted in a 10.7 per cent yield increase. Since there were only trace levels of disease present in any of the plots, the increased yields may have been due to a reduction in transpiration. This type of effect has been noted with another triazole derivative, triadimefon. As expected, the Cerone did not have a significant effect at these yield levels. Due to the low and variable yields, little significance can be placed on this trial.

Prematurity Blight of Wheat

The effect of prematurity blight of wheat on yield was examined in several fields of the cultivar HY320 grown under no till in the Drumheller area. Random samples were taken from three fields with different cropping histories. The average weight of healthy tillers from these fields were 0.94, 0.94, and 0.97 g. The average weight of prematurity blighted tillers was 0.86 g, a 10.3 per cent weight reduction. The sample consisted of 688 tillers, of which 52 (7.5 per cent of the total) were affected by prematurity blight.

POST-HARVEST PROGRAM

The Post-Harvest Program underwent some major revision in 1985. The program was divided into two major areas of responsibility: Post-Harvest storage research and extension; Plant Pathology research and extension, and mushroom extension. The commodity groups that fall into the Plant Pathology component are: potatoes, vegetables, trees, turf, and ornamentals. These commodity groups are of major importance in the Storage component as well.

STORAGE AND HANDLING OF NURSERY STOCK - K. Mallett, T. Krahn, and G. Smith

Seven species of trees and shrubs (saskatoon, Siberian larch, white spruce, Mayday, Nanking cherry, green ash, and Potentilla) were stored in five different environments (see p. 92, 1983 AHRC Annual Report). Three treatments, bare root, bare root treated with a Benlate dip (750 g Benlate (Benomyl) 50% WP)/1000 L water, and bare root covered with peat moss, were evaluated with each species.

All 1982-83 treatments x species x storage combinations were field planted in mid-May, 1983, after six months of storage. Mortality (percent) was determined in July and September, 1984, and in the spring of 1985. The plant mortality observed was as follows: Siberian larch 90.4, saskatoon 78, white spruce 61.2, green ash 29.4, Nanking cherry 26.6, and Mayday 18.1 percent.

In two of the low humidity storages, the peat moss treatment was significantly better than the bare root treatment. In the high humidity storages (R.H. above 90 percent) all treatments were equally effective.

STORAGE AND HANDLING OF PERENNIAL NURSERY STOCK - K. Mallett, T. Krahn, and G. Smith

Five species of herbaceous perennials, (white phlox, Achillea "The Pearl," columbine, crocus, and arctic phlox) supplied by Alberta Nurseries and Seeds Ltd., Bowden, were stored at 1°C and 4°C. Each species received six treatments: in plastic bags, peat moss covered, sand covered, vermiculite covered, bare root, and sawdust covered. All materials were placed into storage in early October, 1983, field planted in late May 1984, and evaluated for survival in early July and mid-September of 1984 and in June 1985. Each treatment x temperature combination was replicated three times with five plants per replicate, and field planted in a randomized complete block design.

The results showed that the treatments had no significant effect on survival. However, significantly ($P>0.05$) more plants survived when stored at 1°C vs. 4°C (77 vs. 60 percent). The percentages of plants that survived were as follows: Achillea 98, white phlox 88, columbine 54, arctic phlox 51, and crocus 33.

HANDLING AND STORAGE OF VEGETABLES - K. Mallett, T. Krahn, and G. Smith

Effect of Storage Period and Fungicide Treatment on Cabbage Quality

Two cabbage cultivars, Ultragreen (a green cultivar) and Storage Red (a red cultivar), were treated with a fungicide treatment two weeks prior to harvest. The treatments were:

Benlate (Benomyl) 50% WP at 0.40 kg/acre (1 kg/ha) plus Manzate 200 80% WP at 0.81 kg/acre (2 kg/ha),

Ipriodione (Rovral) 50% WP at 1.0 kg/ha (0.89 lb/acre), and

Vinclozolin (Ronilan) 50% WP at 0.40 kg/acre (1.0 kg/ha).

Each fungicide or fungicide combination was applied in 40 L of water per acre (40 L/hectare) at 7 and 14 days prior to harvest. A Benlate treatment, applied by dipping the cabbages for 15 seconds in a solution of 50 g Benlate 50% WP/1000 L water, was also assessed. The harvested and dipped cabbages were placed in mesh bags and stored at 1°C and 95% R.H. Five evaluations were made starting after 64 days of storage and at monthly intervals for the 181-day storage period. At each evaluation, shrinkage losses were determined by comparing out-of-storage weight with original weight. Total loss was determined by trimming the aged leaves and decayed spots, or discarding a head when decay could not be trimmed to make the cabbage heads marketable, and comparing the usable weight to the original weight.

All treatments performed equally well during the entire period of storage and no differences were found in total loss, shrinkage, or loss due to decay between cultivars. There were no significant differences in total losses experienced in January, February, or March, but total losses in April and May were significantly greater. Storage Red had less shrinkage than the Ultragreen; however, losses due to mold and decay were approximately equal in both cultivars.

None of the fungicide treatments afforded better post-harvest control of mold growth over the check. On the basis of this and 1984 data, applications of pre-harvest fungicides for control of storage molds in cabbages do not appear warranted.

DISEASES OF TREES - K. Mallett, R.J. Howard, and B. Casement

Susceptibility of Hybrid Poplar to Canker Diseases and Poplar Bud Gall Mites

Thirty-nine species, cultivars or selections of poplars, ten ramets per clone, were planted 1 m apart in rows 4 m apart in the spring of 1975. The trees were evaluated in the summer of 1985 for susceptibility to canker diseases and poplar bud gall mite. The heights

and diameters of living trees were measured. The number of cankers and probable cause of the cankers were noted for each tree. The number of poplar bud gall mite galls per branch sample were counted.

Of the 39 poplar taxa types planted, 28 have survived to date. The cause of mortality among the 11 others was due to a failure to become established and to winter injury. Eleven of these exhibited a high degree of hardiness (<20% mortality). P. x petrowskyana, P. x 'Cheyenne,' P. x jackii, P. fremontii, P. x B.L. #3, and P. euramericana 'Eugenii' were resistant to the poplar bud gall mite. All taxa types, except P. deltoides and P. euramericana 'Grandifolia,' had some form of canker. Three types of canker were identified: Cytospora canker, frost crack, and canker of unknown origin.

BACTERIAL RING ROT CONTROL PROGRAM - K. Mallett, I.R. Evans,[1] J. Stenrue,[1] and B. Penner

AHRC post-harvest staff performed bacterial ring rot (BRR) diagnostic tests on plant samples collected during the annual inspection of commercial potato fields in southern Alberta. Of 37 specimens collected eight (21%) were diagnosed as BRR-positive. This was slightly higher than in 1984 when 7 of 37 specimens (19%) were diagnosed as positive. The indirect fluorescent antibody staining (IFAS) test was used in conjunction with the conventional gram staining procedure for the confirmation of BRR in submitted samples. The IFAS test was also used to detect BRR in so-called immune cultivars previously inoculated with Corynebacterium sepedonicum by Dr. I.R. Evans and Mr. J. Stenrue. Materials for the IFAS test were provided by Dr. S.H. DeBoer, Agriculture Canada, Vancouver.

DISEASES OF TURF GRASSES

FAIRY RING CONTROL - K. Mallett, R. J. Howard, and E. Moskaluk

Fairy rings were spiked, drenched with a soil wetting agent (Soil Wet), and soaked with water in the summer of 1984. Two fungicides Oxycarboxin (Plantvax) flowable 20% and Tolylfluanid (Funginex, A.I. 19 g/L) were applied once or twice. The control rings were only spiked and soaked. The rings were evaluated in the summer of 1985 to determine the effect of the treatment. None of the rings treated with fungicides showed any significant ($P>0.05$) decline over the control rings.

DISEASES OF POTATOES - K. Mallett, R. J. Howard, and E. Moskaluk

Under the auspices of the Co-operative Prairie Potato Breeding Agreement, assistance was provided to Dr. D. Lynch, Agriculture Canada, Lethbridge, in roguing field grown lines of potatoes at Vauxhall and in inspecting the potatoes in the AHRC potato program.

[1]Crop Protection Branch, Alberta Agriculture.

A total of 43 seedlings and cultivars from the Prairie Potato Breeding Program were screened for resistance to early blight (Alternaria solani). The breeding lines were planted on May 14, 1985, and sprinkler irrigated to foster blight development. 'Spreader' rows of Warba, a susceptible cultivar, were planted between rows of the test lines to facilitate disease build up. Blight severity was assessed using a visual scale (1 = highly resistant to 5 = highly susceptible), on September 2, 1985. These data were subjected to Scott-Knott Cluster analysis, which dilineated two groupings as follows:

Moderately susceptible to highly susceptible (rated > 3.9)		Moderately resistant to Intermediate (2.0 - 3.8)	
ND 455-1	MIN 10509	A 68710-5	WIS 75-28
ND 383-9	ND 656-1	W 760	WIS 75-7
WIS 75-9	MIN 8742	ND398-1	MIN 9632
ND 388-1	MIN 10162	A74114-4	WIS 75-30
WIS 74-70	ND 552-2	WIS 75-37	WIS 75-17
WIS 74-11	F 76080	ND 450-11	A 74117-9
F77001	W 848	W 843	A 6948-4
Norland	MIN 9885	WIS 74-36	Norchip
F77067		WIS 74-52	WIS 75-3
		WIS 74-7	Russett
		WIS 75-2	Burbank
		W 844	A 69868-2
		W 847	A 75195-2
		A 7411-2	MIN 8777

Evaluation of Fungicides for the Prevention of Seed-Piece Decay in Potatoes

Five fungicides:

- Agrox Seed Piece Dust (Mancozeb 16%),
- TF 3664 seed treatment (mancozeb 16% + fir bark),
- Fir bark (from Douglas fir),
- Easout potato seed piece treatment (thiophanate-methyl 10% plus diazinon 0.2%), and
- Polyram 7 Dust (metriam 7%)

were used to treat cut seed-pieces of Norchip potatoes. Unsuberized and suberized potato seed-pieces were used as checks. The seed-pieces were planted May 16, 1985, and were heavily irrigated following planting to produce conditions favorable to seed-piece decay. The plot was harvested October 11, 1985. Dates of 50 percent emergence, stand count, total yield, and marketable yield were recorded.

There was no difference ($P<0.05$) between the unsuberized check, the suberized check, and any of the fungicide treatments with regard to date to 50 percent emergence, stand count, or total yield. There was significantly ($P<0.05$) less marketable yield with Polyram treated seed than the unsuberized check. The stand counts indicated that very little seed-piece decay occurred during this growing season.

Detailed results of this trial were reported in the 1985 Pesticide Research Report of the Expert Committee for Pesticide Use in Agriculture, Agriculture Canada, Ottawa.

DISEASE SURVEYS - K. Mallett, G. LePage,[1] and N. Collard[2]

A survey of wilt diseases in seed potato fields in Alberta was conducted in conjunction with Ms. G. LePage and Mr. N. Collard. Of 16 specimens submitted, 6 were found to have Verticillium dahliae, 3 had V. albo-atrum, 1 Fusarium oxysporum, 4 Erwinia carotovora, and 4 samples did not have any known pathogen associated with them. Verticillium wilt was found as far north as Edmonton.

[1]Agriculture Canada, Edmonton

[2]Agriculture Canada, Lethbridge

WEED CONTROL PROGRAM

The major objectives of the weed control program are:

a) To improve existing weed control practices for vegetable, nursery, fruit, and special crops by evaluating commercial and experimental herbicides.

b) To assist staff of the AHRC Regional Crop Laboratory with the diagnosis of herbicide injury on crops and identification of plant specimens.

c) To provide weed control information to commercial and amateur growers.

Herbicides in the following report are referred to by either generic names or experimental codes. All rates are expressed in terms of active ingredient. Further details of the trials reported here appear in the 1985 Research Report of the Expert Committee on Weeds (Western Canada).

In most trials, herbicidal treatments were applied as aqueous mixtures at the rate of 121 L/ac (300 L/ha) at 275 kPa to plots measuring 1.8 m x 5.6 m. Graminicides were applied at 45 L/ac (110 L/ha) of water and combined with an adjuvant when recommended by the manufacturer.

A $C0_2$-pressurized sprayer with a hand-held boom was used for application. Treatments were generally replicated four times in a randomized complete block design. Treatments applied pre-planting and incorporated into the soil are designated "PPI," and those applied pre-emergence to the crop as "pre." In 1985, a total of 33 experiments were conducted as part of seven main projects.

WEED CONTROL IN PULSE CROPS - R. Esau and V. Rumney

Four trials with dry beans were conducted at AHRC. In one trial, AC 263,499 (experimental product from American Cyanamid) applied at several rates, PPI, pre, and postemergence, was evaluated for crop tolerance and weed control efficacy. At 36 to 72 g/ac PPI (90 to 180 g/ha), AC 263,499 completely controlled lamb's-quarters and common purslane; treatments applied after crop emergence were least effective. Crop tolerance to postemergence and PPI applications of AC 263,499 was excellent, but crop injury was noted from pre-emergence treatments.

Crop tolerance of beans to fomesafen (Flex) was confirmed with this year's testing. Five bean types, Great Northern, navy, pink, pinto, and small reds, showed complete tolerance to postemergence applications of fomesafen. Fomesafen completely controlled redroot pigweed and common purslane, but control of lamb's-quarters was marginal.

In previous years, lactofen (Cobra) had been evaluated as a pre-emergence treatment, but in 1985, it was tested postemergence. Like fomesafen, lactofen also belongs to the diphenyl ether chemical family. Similarly, lactofen controls redroot pigweed and common purslane but does not adequately control lamb's-quarters.

WEED CONTROL IN POTATOES - R. Esau and V. Rumney

A trial to evaluate the tolerance of various potato cultivars to metribuzin (Sencor, Lexone) was continued. On the basis of these tests and similar studies at Morden, Manitoba, and Agassiz, British Columbia, a list of potato cultivar tolerances to metribuzin has been prepared. (Expert Committee on Weeds, Report of the Research Appraisal and Planning Committee, 1985).

Twelve pre-emergence herbicidal treatments were tested on Russet Burbank potatoes. With low weed populations, fluorochloridone (Racer), fomesafen (Flex), and lactofen (Cobra) treatments provided potato yields equivalent to the standard treatment (EPTC (EPTAM) + metribuzin PPI) and the hand-weeded check. However, one experimental product, FMC 57020 (Command), caused crop injury and significantly ($P \leq 0.05$) reduced potato yields.

In a third trial, postemergence applications of graminicides alone and in mixtures with metribuzin were evaluated for broad-spectrum weed control. DPX-Y6202 (Assure), cloproxydim (Selectone), or haloxyfop methyl (Verdict) mixed with metribuzin all provided excellent control of green foxtail and lamb's-quarters. These treatments did not cause significant crop injury and yields were comparable to the hand-weeded check.

WEED CONTROL IN VEGETABLES CROPS - R. Esau and V. Rumney

Pumpkin and Squash

Weed control trials for pumpkin and squash were continued. Under clear plastic mulch, the use of chloramben (Amiben) herbicide did not improve weed control or yields of either crop. However, when grown without plastic mulch, weed control and yields in the chloramben plots were significantly improved over that of the weedy check.

Onions

Four trials were conducted with Improved Autumn Spice onions seeded in late April. Studies with pendimethalin (Prowl) were continued. Results confirmed crop toxicity when this product was applied PPI at 0.6 kg/ac (1.5 kg/ha), but crop tolerance was acceptable at 0.4 kg/ac PPI (1 kg/ha). Ioxynil (Totril) was applied as an overall treatment to control common groundsel.

Oxyfluorfen (Goal) showed similar results to other years. A single application of oxyfluorfen does not provide adequate weed control. In 1985, Agriculture Canada granted a restricted class, temporary registration for the use of Goal on onions.

Trials were also continued with bromoxynil (Torch, Pardner), which has similar chemistry to ioxynil (Totril), for efficacy and crop tolerance.

Carrots

Carrots continued to show excellent tolerance to fluorochloridone (Racer); this herbicide also provided excellent broad-leaved weed control. In this test, linuron applied postemergence gave superior weed control to linuron applied pre-emergence. Carotene analyses were performed for each treatment, and there was no significant difference in carotene resulting from the treatments.

Processing Peas

Two trials were conducted with a processing pea, cultivar Dual. In the first trial, herbicides were applied postemergence for grass control. Green foxtail treated with DPX-Y6202 (Assure) was initially controlled, but recovered later. Tank mixing DPX-Y6202 with metribuzin (Sencor, Lexone) plus surfactant caused temporary crop injury, whereas, DPX-Y202 alone did not cause crop injury. In a trial with pre-emergent herbicidal treatments, fluorochloridone (Racer) continued to show promising results; it completely controlled wild mustard, kochia, and lamb's-quarters. Cyanazine (Bladex) at the two highest rates tested (0.6 and 1 kg/ac; 1.5 and 2.4 kg/ha) was injurious to the crop; cyanazine at a lower rate (0.2 kg/ac; 0.5 kg/ha) failed to provide adequate weed control.

Control of Grassy Weeds in Vegetable Crops

As in 1984 tests, cauliflower, cabbage, rutabagas, carrots, and onions exhibited complete tolerance to the graminicides tested. Those herbicides which had been tested for 2 previous years were not incorporated in 1985 tests. All graminicides in this test effectively controlled wild oats. TF1195 (Fusilade) and SC1084, (experimental product from Stauffer Chemicals) however, did not adequately control green foxtail. DPX-Y6202 (Assure), RE-36290 (Selectone), and HOE33171 (Excel) gave the best overall control of annual grasses, although HOE33171 did not control wheat.

HERBIGATION - R. Esau and V. Rumney

An irrigation simulator was constructed by AHRC staff for herbigation or chemigation studies. The amount of water that can be applied to 3.6 x 6 m plots can be controlled by keeping the pressure constant and timing the period of application. The water source was

the underground irrigation system which is pressurized at approximately 415 kPa.

The irrigation simulator was operated for 1 h to apply 12 mm of water and during this time, a herbicide treatment was injected for 10 min. The three main potato cultivars in Alberta, Russet Burbank, Norchip, and Norland, were grown in duplicate rows in each plot. The potatoes had been hilled with a rotary corrugator just prior to the chemigation treatments.

No crop injury was detected from any of the four selected herbicidal treatments. Metolachlor (Dual), EPTC (Eptam), or cycloate (Roneet), when combined with metribuzin (Lexone or Sencor), provided the best weed control of lamb's-quarters, wild mustard, and green foxtail. Metribuzin alone was weak in controlling green foxtail. Crop yields of the three cultivars were not significantly affected.

NURSERY CROPS AND SHELTERBELTS - R. Esau and V. Rumney

In 1985, a co-operative field nursery trial was conducted at Parkland Nurseries, Red Deer, and one container trial was located at Eagle Lake Nurseries, Strathmore. In addition, two nursery container trials were conducted at AHRC.

Oxyfluorfen (Goal), as in other years, gave good results in nursery field crops; this chemical at 0.6 kg/ac (1.6 kg/ha) controlled more than 80 percent of the lamb's-quarters, wild buckwheat, and chickweed populations at the Red Deer site. Oxyfluorfen did not cause any discernible injury to Colorado spruce and mountain ash. Oxyfluorfen and lactofen (Cobra) suppressed dandelion and Canada thistle early in the season.

In the container trials, major emphasis was placed on testing trifluralin (Treflan, Rival) as a surface treatment without incorporation. Trifluralin can be readily obtained anywhere in Western Canada; this is a distinct advantage compared to the unknown and uncertain future of many non-registered herbicides. This chemical injured actively growing juniper but merits further investigation on deciduous stock and should be tested for dormant conifers.

SMALL AND NATIVE FRUITS - R. Esau, V. Rumney, and J. Kitt[1]

Weed Control in Saskatoons

This project was carried out in conjunction with the Alberta Fruit Growers' Society which provided a technician and support staff to conduct herbicidal trials with saskatoons in the Peace River region of Alberta.

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[1]J. Kitt, Technician, Alberta Fruit Growers' Society, Sexsmith.

The objective of one trial was to evaluate several herbicides for quackgrass control in an established saskatoon orchard. Glyphosate (Roundup) applied prior to bud break of saskatoons caused injury to the suckers, since these were earlier in breaking dormancy than the mother plant. The best control of quackgrass, with no crop injury, was provided by haloxyfop methyl (Verdict), applied as a split application. The extreme drought conditions later in the growing season may have assisted in preventing quackgrass regrowth.

In the main trial near Sexsmith, oxyfluorfen (Goal) continued to show results equal to or better than the standard treatment, linuron (Afolan, Lorox). Dandelion was the main weed and only a few annual weeds were observed in early June. By July, however, stinkweed was the main weed. All herbicidal treatments provided at least 70 percent control of stinkweed.

Agriculture Canada, Regina, Saskatchewan, has completed its linuron residue analyses of saskatoon fruit from four prairie locations, two of which were in Alberta. No residues were found in the fruit, hence a minor use registration of linuron for use on saskatoons is anticipated.

EFFECTS OF CHLORSULFURON AND DPX-T6376 ON SUCCEEDING ROTATIONAL CROPS - R. Esau and V. Rumney

Chlorsulfuron (Glean) applied at the twice the recommended rate (16 g/ac; 40 g/ha) in 1981, did not significantly affect yields of lentils and potatoes, although crop injury was still noticeable on these crops and on alfalfa in 1985. Similarly, the 1982 application of chlorsulfuron at twice the recommended rate (16 g/ac; 40 g/ha) caused injury to lentils and alfalfa, but yields could not be taken due to heavy weed infestations.

DPX-T6376 (Ally), a herbicide showing potential for use in cereal crops, showed carryover effects at 4.9 to 9.7 g/ac (12 to 24 g/ha). However, no injury was detected at Brooks, Standard, or Bow Island, when DPX-T6376 was used at normal rates (1.2 to 1.8 g/ac; 3 to 4.5 g/ha).

FOOD PROCESSING AND QUALITY EVALUATION PROGRAM

The activities of the Food Processing and Quality Evaluation Program fall into three main areas: service, extension, and research. The service activities of the Program consist of work which is carried out in the laboratories on crop material submitted by AHRC-based production programs, for example, the Potato, Post-Harvest, Vegetable, Market Garden, Pomology, and Irrigation Programs. Chemical, processing, and sensory tests are performed on fresh, stored, and processed horticultural crop material from on- and off-Center research plots. Extension activities refer to work carried out for growers' groups, individual growers, and the food processing industry in the areas of product and/or process development. In addition to the service and extension activities, research is carried out on a variety of independent projects.

USE OF RADIOGRAPHY TO MONITOR CHANGES IN VEGETABLES DURING PROCESSING - T. Smyrl and J. Hung

Work previously conducted in this program has shown that the X-ray technique could be used to follow moisture profiles during the dehydration and rehydration of vegetables. This technique is suitable since X-rays are able to differentiate between tissue containing water and tissue containing no water. In this study, the X-ray technique was used to follow the transfer of soluble solids into vegetable pieces during the process of osmotic dehydration. Osmotic dehydration consists of immersing fruit or vegetable pieces in a concentrated osmotic solution, whereby water, which normally constitutes 80-90 percent of fresh produce, flows out of the produce into the osmotic solution. During the process of osmotic dehydration, not only does water flow out of the food material, but solute from the osmotic solution diffuses into the food piece. Sodium chloride has been commonly used as an osmotic solute; however, if too much of this solute diffuses into the food, the food will taste too salty. To evaluate which factors control the transfer of solute into the food, diced vegetables were immersed in osmotic solutions containing sodium chloride and sucrose at various concentrations. In addition to the osmotic solute, the osmotic solution contained dissolved calcium chloride. The purpose of the calcium chloride was twofold. Since the calcium ion readily absorbs X-rays, its movement into the food piece could be easily monitored. In addition, the size of the calcium ion is very similar to the size of the sodium ion found in osmotic solutes containing sodium chloride.

At progressive stages of the osmotic dehydration process, samples were removed from the osmotic solution and X-rayed (Hewlett Packard, 43805N, X-ray System). The X-ray technique was used to nondestructively monitor the position of the advancing calcium front in the vegetable piece. The results of these experiments generally showed that calcium penetration in the diced vegetables a) decreased as the viscosity of the osmotic solution increased, and b) decreased as the concentration of osmotic solute and calcium ion (dissolved in the osmotic solution) decreased.

DEVELOPMENT OF SUGAR BEET HANDLING PROCEDURES THAT REDUCE SUGAR LOSSES DURING HARVEST AND STORAGE -

P. Bergen, T. Smyrl, C. Linowski, and J. Hung

This project was co-ordinated by Dr. Peter Bergen, Research Agriculturist, Alberta Sugar Company, Taber, and was funded by a Farming for the Future grant awarded jointly to the Alberta Sugar Beet Growers' Marketing Board, Lethbridge, and the Alberta Sugar Company. The Food Processing and Quality Evaluation Program was responsible for the gas liquid chromatographic analysis of sucrose, glucose, and fructose in fresh and stored sugar beets.

During the 1984 harvest, beets from the two co-operating growers were received at the Alberta Sugar Company plant in Taber. During the harvesting operation, beets were loaded into one of two types of trucks: standard trucks and trucks equipped with a rope-cushion device (cushioned trucks). The rope cushion was designed to lessen beet damage during harvest and handling. The beets were sampled at the plant from the trucks and pilers. A portion of the beet sample was inspected for cracks and breakage, and analyzed for moisture, sucrose, glucose, and fructose. Other portions of the beet samples were stored for 88 days at an average temperature of 2°C and at a relative humidity of 90 percent. After storage, the beets were analyzed for sucrose, glucose, and fructose, and comparisons were made with the sugar content of the beets at harvest prior to storage.

The truck-mounted rope cushion device significantly ($P<0.05$) reduced beet cracking and breakage by 27.5 and 20.9 percent, respectively. In addition, the percentages of load weight returned to the trucks after piling was significantly ($P<0.05$) less (13 percent) for the cushioned trucks in comparison with the standard trucks. The percentages of sucrose, glucose, and fructose for fresh and stored samples are presented in Table 13.

Table 13. Percentage of sucrose, glucose and fructose in fresh and stored beets loaded into standard and cushioned trucks.

	Off Truck		Off Piler	
	Standard	Cushioned	Standard	Cushioned
	%	%	%	%
Fresh Beets				
Sucrose	16.59	17.10	16.73	16.61
Fructose	0.08	0.09	0.06	0.06
Glucose	0.17	0.12	0.13	0.12
Stored Beets				
Sucrose	16.23	16.44	16.39	16.42
Fructose	0.19	0.19	0.22	0.26
Glucose	0.42	0.40	0.44	0.49

According to these results, the use of the truck-mounted cushion had no immediate effect on the sugar content of the fresh beets. This result is to be expected since sugar losses, resulting from damage to beets, would not have had sufficient time to develop due to the short time between sampling and analysis. The results also show that, in all cases, the sucrose content of the stored beets is lower than the sugar content of the fresh beets; however, in no case is this difference statistically significant ($P>0.05$). More specifically, the cushioning device did not significantly reduce sugar losses during storage as was expected since previous work has shown that damaged beets lose more sugar than undamaged beets during storage. A plausible explanation for this involves consideration of storage temperatures (2°C) and relative humidity (90%) which may be considered as ideal in comparison with fluctuations occurring in an actual pile. Such ideal conditions may not be conducive to respiration and microbial growth or other biochemical reactions which degrade beet sucrose. Reducing sugar (glucose and fructose) content increased after storage, but none of the increases was statistically significant ($P\geq 0.05$).

Changes in the moisture and sucrose content during storage, as influenced by the moisture content of the beet at harvest, are outlined in Table 14.

Table 14. Influence of beet moisture content and storage on moisture, sucrose, glucose, and fructose contents of beets

	Grower 1	Grower 2
	%	%
Fresh Beets		
Moisture	75.94	75.13
Sucrose	16.25	17.58
Fructose	0.10	0.06
Glucose	0.20	0.11
Stored Beets		
Moisture	75.20	74.47
Sucrose	16.35	16.80
Fructose	0.16	0.32
Glucose	0.39	0.50

Beets from Grower 2, which were of an initially lower moisture content, lost a greater amount of sucrose ($P<0.01$) than beets from Grower 1. This result was surprising since analyses of beets during unloading of the trucks showed that the beets with the highest moisture content sustained more damage during harvesting and piling operations. In both the high and low moisture content beets, fructose and glucose levels increased significantly ($P\leq 0.01$) during storage.

EVALUATION OF SASKATOON CULTIVARS FOR USE IN FOOD PRODUCTS UTILIZING THE WHOLE BERRY - T. Smyrl and M. Dench

In food products such as jams, pie fillings, and fruit leathers, which utilize the entire saskatoon berry, the seeds within the berry are necessarily incorporated within the finished product. During the sensory evaluation of saskatoon products, panelists have often commented on the undesirable textural characteristics of the product caused by the sometimes large and numerous seeds. Berries from six saskatoon cultivars, Moonlake, Northline, Honeywood, Forest Berg, Smoky, and Thiessen, grown at AHRC were evaluated with respect to seed characteristics. The berries were harvested July 10 and 11, 1985, cleaned, sorted, and kept in frozen storage (-18°C) until analyses. From a sample consisting of at least 20 berries per cultivar, the following determinations were made: berry weight, seed size, seeds per berry, and seed weight per berry. The results are presented in Table 15.

Table 15. Seed characteristics of six saskatoon cultivars.

Cultivar	Berry weight (g)	Seeds per berry	Seed size (mm)	Seed weight (g)	Seed weight (%)
Moonlake	0.794 a[a]	9.3 b	2.9 a	0.028 a	3.51 a
Northline	0.923 ab	8.0 a	3.6 b	0.043 b	4.77 b
Honeywood	1.021 b	9.8 b	3.6 b	0.057 cd	5.66 bcd
Forest Berg	0.886 ab	9.0 b	3.7 bc	0.049 bc	5.69 b d
Smoky	0.913 ab	9.8 b	3.9 c	0.063 d	7.06 d
Thiessen	1.351 c	9.2 b	4.2 d	0.066 d	4.86 bc

[a]Means within columns not followed by the same letter are significantly different from each other ($P \leq 0.05$).

The data presented in Table 15 suggest that, from a processing point of view, cultivars such as Moonlake and Northline should be considered for incorporation into products such as jams, pie fillings, and fruit leathers. Although the average number of seeds per berry for Moonlake is similar to that of the other cultivars, seed size and total seed weight per berry are significantly lower than the same characteristics for the other cultivars. In addition, the percentage of seed in the whole berry is substantially lower for Moonlake than the other cultivars.

INFLUENCE OF pH, TEMPERATURE AND PROCESSING TIME ON THE DECOMPOSITION OF GLUCOSE AND FRUCTOSE DURING PROCESSING - T. Smyrl and J. Hung

Previous work evaluated the degradation of sucrose as a function of pH, temperature, and processing time. Particular attention was paid to acidic pH values. It was found that sucrose destruction was greatest at low pH, elevated temperatures, and for increased processing times. Since glucose and fructose, which are hydrolytic products of sucrose, are present in many vegetables and acidic fruit species, this study was undertaken to evaluate the stability of these reducing sugars.

Solutions of glucose and fructose (10% w/w) were freeze dried for 24 h at a platen temperature of -10°C. After this drying period, platen temperatures were raised to 20 and 30°C for 8, 16 and 24 h. After the required time-temperature treatment, glucose-containing samples were analyzed for residual glucose (YSI Sugar Analyzer) and absorbances were measured at 280 and 420 nm. Fructose containing samples were analyzed for absorbance at 280 and 420 nm only. Absorbance measurements at 280 nm were used to monitor the first stages of reducing sugar decomposition since, upon decay, reducing sugars initially form highly unsaturated intermediates which absorb strongly in the ultraviolet region of the spectrum. Absorbance readings in the visible region of the spectrum at 420 nm reflect the actual brown color formation resulting from the end products of reducing sugar decay.

Table 16 shows the results for the degradation of glucose and fructose as monitored by absorbance measurements at 280 and 420 nm.

Table 16. Absorbance of freeze-dried sugar solutions at 280 and 420 nm as a function of pH, temperature and reaction time.

		Temperature								
		20°C					30°C			
		0 h	8 h	16 h	24 h	28 h[a]	8 h	16 h	24 h	48 h[a]
Wavelength	pH									
280 nm	2	0.02	-	33.0	60	0.20	122	246	323	1.9
	3	0.02	-	0.76	2.54	0.09	2.55	4.76	6.42	0.2
	12	0.02	-	0.79	0.89	0.09	1.15	2.07	2.14	0.1
420 nm	2	0.004	-	0.010	0.040		0.061	0.333	0.525	0.019
	3	0.005	-	0.007	0.010		0.070	0.001	0.010	0.008
	12	0.003	-	-	-		0.066	0.213	0.296	0.010

[a]Values represent absorbances of glucose samples after 48 h.

Fructose destruction was greatest at pH 2, with negligible loss at values greater than pH 3 or less than pH 12. For a given time interval, absorbance measurements at both wavelengths were generally greater at the higher temperature. As well, absorbances were found to increase as the length of time was increased for both the 20 and 30°C treatments. Glucose was much less reactive than fructose. Even after a 48 h treatment, absorbances from the glucose samples were much less than the fructose absorbance values when both sugars were subject to the same conditions of pH and temperature. These results suggest that fructose decomposition in acidic fruit species may be a major cause of non-enzymatic browning during processing.

ENTOMOLOGY PROGRAM

CONTROL OF CORN INSECTS - U. Soehngen and A. Tellier

European Corn Borer Survey

In 1985, a survey of European corn borer moths was carried out with pheromone traps using a commercially produced pheromone. The survey was done in co-operation with Dr. Dean Struble, Lethbridge Research Station, and four district agriculturists who collected the data in their areas. Beginning in the first week of July, pheromone traps were set out in 12 southern Alberta locations, covering the areas between Medicine Hat and Taber, and between Taber and Brooks. The traps were collected weekly and the numbers of adult male corn borers caught in them were counted. The results showed that peak flight occurred in the week preceding July 24, and that corn borer populations were greater between Medicine Hat and Taber than they were to the north of the Bow River. This year, for the first time, male moths were also caught in pheromone traps maintained by the Agriculture Canada Research Station.

An attempt was made to determine a possible correlation between the number of adults present in a field and the amount of larval damage. In the hope of developing a method of predicting potential damage to the corn on the basis of adult flights, a larval survey was carried out in six of the twelve fields in which adult traps had been placed. In each field, 150 stalks were collected at random and the numbers of larvae present were counted. Although three of the surveyed fields were located in an area of high adult population density between Taber and Medicine Hat, only one of these fields showed a count higher than 35 borers (256 borers were collected from 150 stalks). A correlation between adult catches and larval density was not found.

Insecticide Spray Trial

Hybrid field corn (NK PX11) was planted during the first week in June, 1985 on a dairy farm south of Medicine Hat. On July 29, insecticides were applied by backpack sprayer to each of two plots per replicate, as follows:

	Applied At
Ambush (permethrin) 50EC	120 g a.i./ha (48.9 g a.i./ac)
Decis (deltamethrin) 5E	17.5 g a.i./ha (7.0 g a.i./ac)
Sevin XLR (carbaryl)	2250 g a.i./ha (970.0 g a.i./ac)
Lorsban (chlorpyrifos) 4E	1100 g a.i./ha (445.3 g a.i./ac)

A second application was made on August 7 to one of the two plots per replicate. No "water only" applications were made to the controls, since a low pressure overhead pivot irrigation system was being used.

The treatments were evaluated at the end of September, when 15 corn stalks were randomly harvested from each plot and the number

of borer larvae per stalk was recorded. All insecticide treatments, except the single application of Sevin XLR, significantly ($P<0.05$) reduced the number of European corn borer larvae in corn stalks when compared to the controls.

CONTROL OF GREENHOUSE CUCUMBER INSECTS - U. Soehngen and A. Tellier

Chemical Control of Thrips on Greenhouse Cucumbers

Thrips are becoming an increasingly serious pest on greenhouse cucumbers. Their feeding results in a loss of leaf surface, and feeding scars on very young cucumber fruit prevent normal growth of the fruit and cause bending at the scar, making the fruit unmarketable. During the spring of 1985, extremely high thrips populations in several Redcliff greenhouses reduced the number of marketable cucumbers by one-half.

These thrips were identified as the western flower thrips, Frankliniella occidentalis, a species resistant to all of the insecticides currently registered for thrips control in greenhouses in Canada. Hence, a trial was initiated to determine the efficacy of several products not currently registered for greenhouse use in Canada. These compounds, applied as ground sprays to kill the thrips as they enter the ground to pupate, included:

a) "Thripstick" (a polybutene compound designed to immobilize the insects, which are then killed by the insecticide incorporated into the compound containing Decis (deltamethrin) 5E,
b) Decis 5E in dormant oil,
c) Lorsban (chlorpyrifos) 4E in dormant oil, and
d) an untreated control.

The test plots consisted of strips of white plastic which lined the ground within the dripline of the cucumber plants on both sides of the rows. Each replicate contained a total of 150 m^2 of plastic, or 37.5 m^2 per treatment. The plots were in a randomized complete design. The insecticides were applied by backpack sprayer at the following rates: (The quantities were calculated to cover an area of 150 m^2, i.e., four treatments).

1)	Thripstick	2.5 kg	2)	Decis 5E	15 ml
	Decis	12.5 g		Dormant oil (3%) ..	505 ml
	Water	2.5 kg		Water	16 L

3)	Lorsban	24 ml
	Dormant oil (3%)	505 ml
	Water	16 L

The numbers of thrips present on three leaves (upper, middle, and lower) from each of five plants in the center of each test plot were

counted at weekly intervals, for 8 weeks. The results showed that the compounds tested provide little or no control of thrips on greenhouse cucumbers. The thripstick and information on application rates was provided by M. Steiner of the Alberta Environmental Centre in Vegreville.

Thrips Biology on Greenhouse Cucumbers

To determine the area to be covered with an insecticide used as a ground spray to control pupating thrips, yellow sticky boards were placed under the foliage of 30 commercial greenhouse cucumber plants at: a) the stems, b) 30 cm from the stems, and c) 60 cm from the stems (at the drip line). The numbers of adult and immature thrips collected on the plants were counted at weekly intervals over a 4-week period. This trial showed that immature thrips drop from the foliage, where they develop, to the ground.

Significantly ($P<0.05$) larger numbers of thrips were collected at location b) (30 cm away from the stems) than at location c) (stems). Fewer immature thrips, but a larger number of mature thrips were collected at near the drip line than at 30 cm from the stems, but more immature and mature thrips were collected at both the dripline and under the canopy than at the stems. To control pupating thrips, an insecticide must be applied to the entire surface within the drip line.

CONTROL OF VEGETABLE INSECTS - U. Soehngen and A. Tellier

Chemical Control of Thrips on Cabbage

Cabbage seedlings (cv Houston Evergreen) were set out on May 29, 1985, at the Alberta Horticultural Research Center. Insecticides were applied with a backpack sprayer at weekly intervals through July and August at the following rates:

	Applied At
Dibrom (naled)	963 g a.i./ha (289.7 g a.i./ac)
Decis (deltamethrin) 5E	17.5 g a.i./ha (7.1 g a.i./ac)
Cygon (dimethoate) 4E	528 g a.i./ha (213.7 g a.i./ac)

Weekly applications of Thuricide (*Bacillus thuringiensis* var. *kurstaki*) were also made to all plots to control lepidoperous pests. Beginning on July 9, two cabbages were harvested weekly from each plot and examined for thrips.

Only the Dibrom treatment significantly ($P<0.05$) reduced thrips numbers on cabbages, when compared with the check. Although some control was achieved with Dibrom, thrips numbers did not differ significantly on cabbages treated with Dibrom when compared with the check. Only Decis provided the degree of control necessary to market the cabbage without removal of several wrapper leaves.

Resistance of Cabbage Cultivars to Thrips Damage

Seedlings of four cabbage cultivars (Blue Crown, Copenhagen, Conquest, and Quick Green Storage) were planted at A.H.R.C. on May 29, 1985. As with the above trial, these plants also received weekly applications of Thuricide throughout July and August to control imported cabbage worm and other lepidopterous larvae. Beginning on July 9, two cabbages were harvested from each plot at weekly intervals and the numbers of thrips counted.

Thrips numbers remained low until mid-July, when the populations of thrips suddenly increased. Of the four cultivars tested, Copenhagen attracted significantly more thrips ($P \leq 0.05$) than any of the other cultivars in the trial, although the damage was not significantly greater on this cultivar than on the other three.

SURVEYS - U. Soehngen and A. Tellier

Elm Bark Beetle Survey

On June 4 and 5, 1985, 14 pheromone traps for the European elm bark beetle, the vector of Dutch elm disease, were placed at all border crossings from the United States into Alberta and at various locations across southern Alberta. A 'trap log' was also placed at each location to detect the possible presence of native elm bark beetles, which are also capable of transferring Ceratocystus ulmi, the fungus causing Dutch elm disease (DED), from tree to tree. The traps were changed twice during the season. Both traps and logs were collected in mid-September; no beetles were found.

In addition, two truckloads of firewood confiscated at the U. S. border from tourists entering Alberta were inspected for the presence of the fungal pathogen and the beetle vectors. Although several old elm logs showed signs of a previous beetle infestation, neither beetles nor the DED fungus was found to be present.

Grasshopper Survey

Weekly surveys of hatching grasshopper populations were made in co-operation with M. Dolinski, Alberta Agriculture, Edmonton, and Dr. D. Johnson, Agriculture Canada Research Station, Lethbridge. The area assigned to AHRC staff was to the east and south of Medicine Hat. Populations varied greatly between locations. In addition, the hatch in this area was extended in 1985 because of prolonged periods of cool weather.

Cutworm Survey

The Entomology staff at the Alberta Horticultural Research Center also co-operated with M. Dolinski, Alberta Agriculture,

Edmonton, in conducting a cutworm survey. Traps were set out in several locations in the Brooks area and changed weekly during July and August. The moths were sent to Dr. R. Byers, Agriculture Canada Research Station, Lethbridge, for identification and tallying.

CANADIAN LEAFCUTTER BEE COCOON TESTING CENTER - U. Soehngen and P. Tognet

The Canadian Leafcutter Bee Cocoon Testing Center operates under the direction of the Canadian Alfalfa Seed Council and is supported by the fees charged to growers for sample analyses. AHRC provides physical facilities, advice, and a limited amount of direct assistance.

In 1985, a Technical Advisory Committee was formed. Membership of this committee is composed of U. Soehngen, AHRC entomologist; K. Richards, Agriculture Canada Research Station, Lethbridge; D. Murell, Saskatchewan Agriculture; B. Fingler, Manitoba Department of Agriculture; and D. Svenson, President, Canadian Alfalfa Seed Council. The purposes of the Committee are to oversee the operation of the Canadian Leafcutter Bee Cocoon Testing Center, and to make recommendations on possible improvements in the Center's operations to the Canadian Alfalfa Seed Council.

In 1984-1985, the Testing Center operated from November 1, 1984, to April 30, 1985. During this time 312 samples were submitted for X-ray analysis, an 11 percent increase over the number of samples processed in 1983-84. Approximately one-half of these required incubation for sex ratio as well. Of the samples submitted from Alberta, 21 were found to contain low levels (0.16 - 1.05 percent) of chalkbrood (caused by the fungus Ascosphaera aggregata); one sample containing chalkbrood was submitted from Saskatchewan and one from Manitoba. The levels of infection were 0.18% and 0.16 percent, respectively. Suspect samples were submitted to the Biosystematics Research Institute, Agriculture Canada, Ottawa, for confirmation.

Four 10-g subsamples from each sample submitted to the Center were X-rayed and the following were determined: cocoons per lb, and percentages of viable cocoons, dead cocoons, incomplete cells, 2nd generation, and parasitization (Table 17). Sex ratios were determined by incubating all of the viable cocoons (as determined by X-ray) in the four subsamples and counting the numbers of male and female bees.

The individual results were sent to each beekeeper in strict confidence.

Table 17. Results obtained at the Canadian Leafcutter Bee Cocoon Testing Center in 1984/85.

Prov.	Cocoons per lb	Viable cocoons (%)	Dead cocoons (%)	Incomplete cells* (%)	2nd gen. (%)	Paras. (%)	Female (%)
Alta.	3802	76.02	1.33	20.32	0.92	0.95	37.61
Man.	4026	79.70	1.33	17.04	0.82	0.65	32.92
Sask.	4189	83.50	1.01	13.11	0.61	0.45	40.47
Average age	3968	79.13	1.21	17.35	0.80	0.73	38.30

* Includes "pollen balls" and larvae that died before pupation.

NOTE: The number of samples received from each region was as follows: Alberta - 159, Manitoba - 42, Saskatchewan - 108, Eastern Canada - 3. Figures for Eastern Canada were not included in the average because of the small number of samples submitted. Also not included are figures for predator infested cells, and cells in which larvae failed to mature, amounting to a total of less than 1 percent in each case.

REGIONAL CROPS LABORATORY PROGRAM

ALBERTA HORTICULTURAL RESEARCH CENTER, BROOKS -

M. Dykstra, R. Howard, U. Soehngen, R. Esau, and A. Tellier

The Southern Alberta Regional Crops Laboratory, located at the AHRC, provides plant disease, pest, and weed diagnostic services to commercial growers and home gardeners in southern Alberta. In 1985, the AHRC Regional Crops Laboratory received 1495 specimens. This total is 9.2 percent less than that of 1984, a reflection of the effects of the drought and grasshopper infestation in 1985. A breakdown of specimens received is presented in Table 18.

Table 18. Summary of plant specimen receipts at the Southern Alberta Regional Crops Laboratory in 1985

Crop Category	Number of specimens			% commercial per category	% total specimens
	Plant disease	Pest	Unidentified plants		
Woody ornamentals	318	74	21	0.1	27.6
Herbaceous ornamentals	174	29	48	4.8	16.8
Greenhouse crops	93	9	0	3.9	6.8
Potatoes	138	2	0	4.7	9.4
Field Crops	124	26	25	11.3	11.7
Fruits	73	16	17	0.1	7.1
Vegetables	95	9	0	2.3	7.0
Indoor pests	-	45	-	0	3.0
Miscellaneous	55	23	9	1.2	5.8
Waste area	-	-	9	0	0.6
Pasture	-	-	41	0.7	2.7
Hay crop	-	-	12	0.6	0.8
Water course	-	-	10	0.3	0.7
TOTAL	1070	233	192	30.0	

Total number of specimens = 1495

Following is a summary of plant problems encountered in 1985. A more detailed account was published in the December 1985 edition of the AHRC Crop Protection Newsletter, Vol. 9, #12.

Summary of Plant Disease Problems Diagnosed

Climatic conditions continued to play a major role in plant health in 1985. A wet September in 1984, followed by freeze-up and snowfall

in mid-October, resulted in the insufficient hardening of many perennial plants. As a result, many plants, especially those already stressed by drought and other environmental factors, suffered winter damage ranging from desiccation and freezing injury of various plant parts to outright death. Hot, dry conditions during the early part of the growing season were followed by moist, cool conditions in August and September. The continued drought resulted in serious crop losses which were compounded by severe grasshopper infestations in many areas. Rains in mid-August came too late for most crops and hindered harvest efforts.

By May it was apparent that many alfalfa fields had suffered varying degrees of winter injury. Common root rot was the most prevalent disease seen on both spring and winter wheats. This disease, in conjunction with the drought, resulted in severe yield losses in dryland crops across the south. In general, leaf spot diseases of cereals were at low levels, although tanspot (Pyrenophora trichostoma) and spot blotch (Cochliobolus sativus) were diagnosed in a few instances. An isolated outbreak of stripe rust (Puccinia striiformis) occurred in a 100-acre field of Fielder wheat near Brooks. Frequent irrigation and cool August nights created ideal conditions for development of this disease.

Foliar chlorosis and browning were apparent on many spruce trees and other evergreens in the south in spring, the result of winter desiccation. Winter injury to deciduous trees was exemplified by sunscald, branch dieback, and unthrifty growth. Injured tissues were frequently invaded by canker fungi. Severe Cytospora infection was seen on mountain ash. Winter kill on raspberries was common. Fireblight was the most common disease seen on apples and crabapples in 1985. Pink snow mold (Gerlachia nivalis) was extensive on AHRC grounds in spring.

On large tropical plants in interior plantscapes, the development of infectious diseases was often stress related. Pathological diseases diagnosed included bacterial leafspot of English ivy and anthracnose of Kentia palm, caused by Glomerella cingulata. Fasciation caused by Corynebacterium fascians was diagnosed on greenhouse geraniums. Physiological disorders were the most prevalent diseases seen on greenhouse cucumbers and tomatoes.

A bacterial cob rot, believed to have been caused by Pseudomonas spp. and a number of other bacteria, was identified in two commercial sweet corn fields. Cottony soft rot, caused by Sclerotina sclerotiorum, was diagnosed on carrots and chicory in storage. Fusarium corm rot was diagnosed on asparagus.

Summary of Pest Problems Diagnosed

During 1985 many different pests were encountered on a variety of ornamentals. On poplars, blotch leaf miners (family Gracillariidae) were the most common pest seen. On spruce, spider mites (Tetranychus

urticae) were common. Top kill, caused by the white pine weevil Pissodes strobi, was also diagnosed. Bark beetles (Leperisinus californicus), which kill individual branches, were occasionally found on green ash. Fir cone worms (Dioryctria sp.) infested cones in a Douglas fir shelterbelt at the AHRC. Cottony maple scale (suspect Pulvinaria sp.) was diagnosed on highbush cranberry collected from a yard in Medicine Hat.

Throughout the summer, aphids were found on several hosts including highbush cranberry and American Elm, and high populations of the winged generation developed by late summer. Damage caused by the aphid Hyadaphis tataricae, the feeding activity of which induces a witches' broom at the ends of honeysuckle branches, was reported from several areas. More information on this unusual pest was presented in an article written by Dr. Ulf Soehngen for the October 1985 edition of the AHRC Crop Protection Newsletter.

Blister beetles (family Meloidae) were seen on a variety of hosts including caragana, lilac, canola, alfalfa, and miscellaneous garden vegetables and ornamentals. The high numbers are attributed to the high grasshopper populations. Although blister beetle adults are voracious plant feeders, the larvae of some species feed on grasshopper eggs.

On vegetables, tuber flea beetle feeding injury was found on potatoes from a home garden in Magrath, and thrips injury was diagnosed on cabbage submitted from Bow Island.

Mormon crickets (family Gryllacrididae) were collected from a barley field near Claresholm. A mass migration of this rather large, chunky grasshopper also occurred in the Medicine Hat-Dunmore area.

The cool wet conditions in August and on into the fall severely hampered harvest efforts, resulting in damp, unsound grain in many instances, being put into storage. Unsoundness shortens the storage life of the grain and gives rise to mold growth. This fall the diagnostic lab received several samples of a small black beetle known as the black fungus beetle, which was being found in high numbers in grain bins. These beetles feed on the various storage molds. They may be easily confused with lesser mealworms which feed on unsound and broken grain.

Summary of Unidentified Plant Specimens Diagnosed

Wild Buckwheat (Polygonum convolvulus), swamp persicaria (P. amphibian), narrow-leaved hawksbeard (Crepis tectorum), and smooth aster (Aster laevis) were among those weeds collected from field crop stubble and fallow land and submitted for identification in 1985. Weeds collected from both native and seeded pastures included common yarrow (Achilles millefolium), plains cinquefoil (Potentilla bipinnatifida), slender beardtongue (Pensteman procerus) and several Aster spp. Among those plants submitted from hay fields were American vetch (Vicia americana),

yellow evening primrose (Oerothera biennis), golden rod (Solidago sp.), and American dragonhead (Dracocephalum parviflorum).

The most common weed problem identified in yards, parks, and gardens was creeping bellflower, Campanula rapunculoides. Its perennial nature and extensive tuberous root system make control difficult. Other weedy plants collected from yards, parks, and gardens included Kochia (Kochia scoparia), common yarrow (Achillea millefolium), ground ivy (Glechoma hederacea), and black nightshade (Solanum nigrum).

Other plants of interest submitted to the AHRC diagnostic lab, collected from waste areas, were garden atriplex (Atriplex hortensis), Nuttall's salt meadow grass (Puccinellia nuttalliana) and tufted white prairie aster (Aster pansus).

REGIONAL CROPS LABORATORY, OLDS - S. Slopek and J. Letal

The Regional Crops Laboratory (RCL) for central Alberta is located in the Provincial Building, Olds. The Diagnostic Service operated by RCL in Olds handled 663 specimens from May through December, 1985. Of these, 317 were disease specimens, 186 were insect specimens, and 160 specimens were sent in for weed identification (Table 19). Field crops specimens made up 20 per cent of the load. The remainder were either ornamental, turfgrass, fruit, vegetable, or household specimens.

As was the case in 1984, many of the pathology problems were abiotic in nature. Winter injury, frost, and drought caused damage to a wide variety of ornamentals. The incidence of fireblight and silverleaf was very low again in 1985. Chemical damage to both ornamentals and vegetables was very common. Spider mites were the most common insect problem. Other commonly submitted insects included aphids, gall-forming insects, spruce webspinning sawflies, and white pine weevils.

Table 19. Summary of specimens received at the Regional Crops Laboratory, Olds, during the period May 1-December 19, 1985

Specimen category	Plant pathology	Entomology	Plant identification
Ornamentals	165	102	26
Cereals	35	4	33
Oilseeds	5	5	5
Turfgrass	15	4	1
Fruit	36	20	0
Vegetable	51	8	3
Household	6	36	-
Storage	-	4	-
Miscellaneous	-	2	45
Total	317	186	160

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ABSTRACTS

In *Report of the Committee on Horticultural Research, Canadian Horticultural Council, March, 1986*

- *Arboretum. B. Casement*
- *Three year pickling cucumber cultivar trial. L. Hausher.*
- *Three year green pepper cultivar trial. L. Hausher.*
- *Timing tunnel removal on pickling cucumbers. L. Hausher.*
- *Timing tunnel removal on green peppers. L. Hausher.*
- *Efficacy of rovral and benlate for control of cottony soft rot on chicory roots. R. Howard and M. Dykstra.*
- *Tolerance of onions to pendimethalin (Prowl). R. Esau.*
- *Weed control in nursery containers. R. Esau.*
- *Efficacy of Imazalil against powdery mildew on greenhouse cucumbers. R. Howard, C. Hill, and G. Grant.*
- *Evaluation of fungicides for the prevention of seed piece decay in potatoes. K. Mallett and R. Howard.*
- *Solute uptake by vegetables during osmotic concentration. T. Smyrl.*
- *Chemical control of European corn borer. U. Soehngen.*
- *Chemical control of thrips on cabbage. U. Soehngen.*

In *Research Report, Expert Committee on Weeds (Western Canada), December, 1985. All abstracts by R. Esau and V. Rumney.*

- *DPX-Y6202 alone and in mixtures for processing peas.*
- *Weed control in processing peas.*
- *Weed control in carrots.*
- *Napropamide formulations for use in cabbage.*
- *Efficacy of pyridate for use in direct seeded cabbage.*
- *Graminicides for use in cole crops, carrots, and onions.*
- *Effects of plastic mulch on squash tolerance to chloramben.*
- *Effect of plastic mulch on pumpkin tolerance to chloramben.*
- *Post emergence herbicides for weed control in onions.*
- *Volunteer cereal control with FOE 3440A*
- *Tolerance of bean cultivars to fomesafen.*
- *PPI treatments for weed control in dry beans.*
- *AC 263, 499 for weed control in dry beans.*
- *Weed control in dry beans.*
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- *Bromoxynil for broadleaf weed control in onions.*
- *Postemergence oxyfluorfen for weed control in onions.*
- *Tolerance of potato cultivars to metribuzin.*
- *Pre-emergence weed control in potatoes.*
- *Postemergence weed control in potatoes.*
- *Herbigation for potatoes.*
- *Weed control in nursery containers.*
- *Weed control for juniper container stock.*
- *Weed control in nursery containers.*
- *Weed control in mountain ash.*

- *Weed control in Colorado spruce*
- *Effects of chlorsulfuron and DPX-T6376 on succeeding rotation crops, Standard, 1984.*
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- *Evaluating imazalil fungicide for the control of powdery mildew on greenhouse cucumbers. R. Howard, C. Hill, and G. Grant.*

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APPENDICES

APPENDIX I. Conversion Table

This report has been written using acre and hectare land measurements. The following conversion factors will be useful for further interconversion of the metric and imperial systems.

	To Convert	Into	Multiply by
Length	kilometres, km	miles	0.621
	metres, m	feet	3.281
	centimetres, cm	inches	0.394
	millimetres, mm	inches	0.039
Area	square kilometres, km^2	acres	247.100
	hectares	acres	2.471
	square metres, m^2	square feet	10.760
Volume	hectolitres, hL	cubic feet	3.532
	litres, L	quarts	0.880
	litres, L	gallons	0.220
Mass	tonnes, t	tons	1.102
	kilograms, kg	pounds	2.205
	grams, g	ounces	0.035
Pressure	kilopascals, kPa	pounds/square inch	0.145
	kilograms/sq cm	atmospheres	0.987
	kilograms/sq cm	pounds/square inch	14.220
	atmospheres, atm	pounds/square inch	14.700
Yield or rate	tonnes/hectare, t/ha	tons/acre	0.446
	kilograms/hectare, kg/ha	pounds/acre	0.892
Temperature	Celsius	Fahrenheit	(9/5°C) + 32
Water measurement	hectare-metres, ha-m	acre-feet	8.108
	hectare-centimetres, ha-cm	acre-feet	0.081
	hectare-centimetres/hour ha-cm/hr	cubic feet/second	0.981
	hectare-centimetres/hour ha-cm/hr	gallons/minute	440.300
	cubic metres/hour, cu m/hr	gallons/minute	4.403
	litres/hectare, L/ha	gallons/acre	0.089
Speed	kilometres/hour, km/hr	miles/hour	0.621
	kilometres/hour, km/hr	feet/minute	54.680

APPENDIX II. Common and trade names of fungicides referred to in this report.

Common Name or Code Number	Trade Name
benomyl	Benlate
carbathlin	Vitavax Solution, Vitavax 75W
carbathlin + thiram	Vitavax Powder
ectaconazole	CGA 64251
iprodione	Rovral
nuarimol	EL-228
thiophanate-methyl	Easout
thiram	Thiram
unknown	RH-5781
vinclozolin	Ronilan

APPENDIX III. Common and trade names of herbicides referred to in this report.

Common Name	Trade Name
bentazon	Basagran
chloramben	Amiben
chlorsulfuron	Glean
cyanazine	Bladex
DPX-T6376	-
DPX-Y6202	Assure
EPTX/R33865	Eptam Plus
fomesafen	Flex
haloxyfop-methyl	Verdict
ioxynil	Totril
linuron	Lorox, Afolan
lactofen	Cobra
metolachlor	Dual
metribuzin	Sencor, Lexone
naptalam	Alanap
oxyfluorfen	Goal
pendimethalin	Prowl
PPG 1013	-
RE 36290	-
R-40244	Racer
sethoxydim	Poast
trifluralin	Treflan